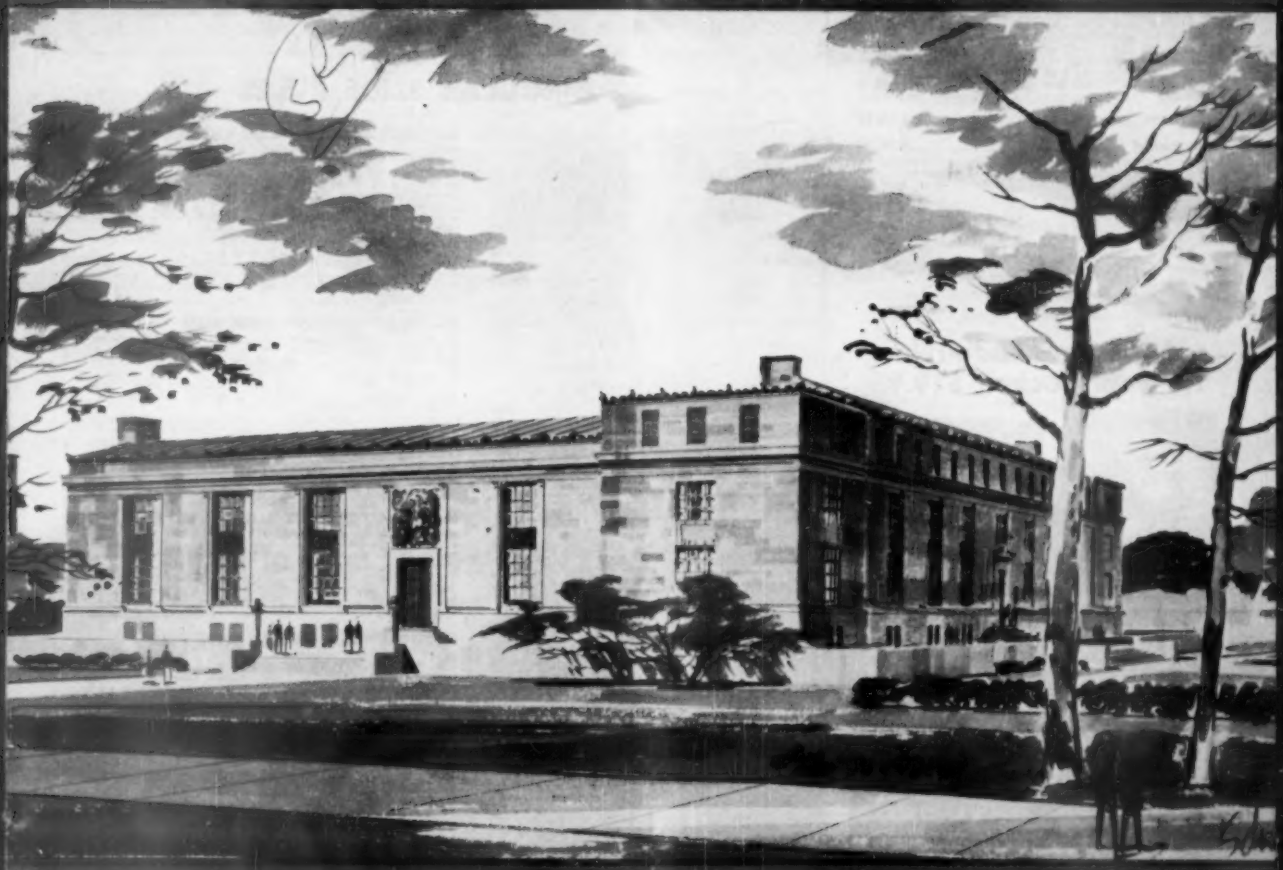
15¢
$5.50 A YEAR

May 9, 1959

VOL. 75 NO. 19 PAGES 289-304

SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE



Academy Gift

See Page 295

A SCIENCE SERVICE PUBLICATION

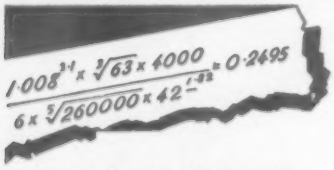
COSMOTRON

- MINIATURE ATOM SMASHER
- PRODUCES 75,000 VOLTS
- ABSOLUTELY SAFE

In no sense of the word a toy or a gadget. The COSMOTRON is a scientific instrument capable of producing 75,000 volts—makes sparks up to 2" long—yet is absolutely safe because the current is infinitesimal. The science teacher—science lover—or hobbyist can perform experiments to astound students—friends—family. Makes smoke disappear—defy gravity—turns propellers at a distance—transforms atomic energy into light—makes artificial lightning—smashes atoms—demonstrates ionic space ship drive—and many other experiments. Constructed of the finest materials. Will do exactly—for instruction purposes—what generators that cost 3 to 10 times more will do. The perfect device to teach the secrets of atomic physics and electricity. Will hold an audience spellbound as it performs trick after amazing trick. Includes an experiment kit and illustrated experiment manual. Manual explains the "how" and "why." You will invent many new experiments of your own. A fine research tool that will give years of beneficial service to the institution or individual who owns one. In kit form or assembled.

Kit Form **$14.95**

Assembled **$19.95**



A 66-inch Slide-rule for your pocket, $19.95

Slide Rule Open

The GENIAC® Calculator carries 66-inch spiral scales yet measures only ten inches fully extended and six inches when closed. Four to five figure accuracy can be relied on. It is indispensable to the scientist, research worker and student. Administrative staff and business men will find it of tremendous value for a host of estimating and checking calculations.

The GENIAC® Slide Rule solves multiplication, division, percentage calculation and gives 5 place logarithms.

You may use it for 30 days and if you are not satisfied repack and mail it back.

What our users say:

"It does all you claim — four or five figure accuracy without eyestrain or magnifiers. Half an hour's study is ample for its use."
A.E.B.

"I use the GENIAC® Calculator for all my slide rule work and need the extra digit which normal slide rules cannot give. I had to get one of my customers a GENIAC Slide Rule last month, after using mine in his office." E. & G. H. Textile Manufacturers.

Slide Rule Closed

All Equipment Protected by 10-Day Return Guarantee & 90-Day Warranty

OLIVER GARFIELD CO., INC.
Dept. SL-59-B, 108 East 16th St.,
New York 3, N. Y.

Name .....

Address .....

Please send me the following:

.....

.....

Please send Check or M.O. In NYC add 3% Sales Tax.

900X "MICROBE HUNTER"

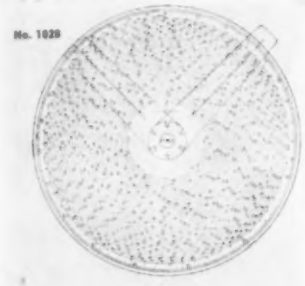
- The only Microscope in its class featuring GRADE A optics!
- Power Range 25X, 50X, 75X, 100X, 150X, 200X, 300X, 400X, 600X, 900X
- Full Range Fine Adjustment
- Safety Stop on Coarse Adjustment

This instrument—made to our rigid design specifications—has wide usage in schools, laboratories and law enforcement agencies. All of the most needed features have been incorporated to meet the requirements for diversified micro-studies. Highly recommended for serious hobbyist desiring exceptional quality at modest cost. Power range from 25X to 900X in 12 possible combinations. Geared rack and pinion coarse focusing. Micro-motion fine focusing of full range—12 complete revolutions. Safety stop prevents over rise. 36mm dual surface (plano/concave) mirror. Fixed square stage, 70mm X 80mm. Rotating 5-hole, disc diaphragm. Three Huygenian eyepieces of 5X, 10X and 15X. Four achromatic objectives of 5X, 10X, 40X and 60X. Oversize base insures stability and protects objectives. Body tilts through 60°—perfectly balanced at any angle. Complete with upright, wooden carrying case.

F-338—List $69.95 ..... **Net $39.95**

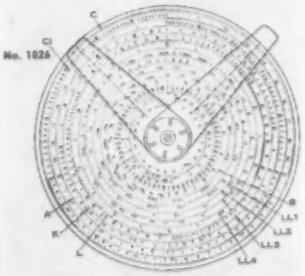
(Add $1.00 for postage and handling)

CIRCULAR SLIDE RULES



No. 1028 "ATLAS" SLIDE RULE

Made of white enameled aluminum. Diameter 8 5/16", engine divided. The outer Scale is the equivalent of a straight 25" long slide rule. The next scale is divided in equal divisions and is used for solving a few types of problems and for quickly locating any factor on the spiral. The third scale is a spiral having 30 coils and equivalent to a straight slide rule 60 feet long. The "ATLAS" is invaluable for many types of work, as it replaces the larger and more cumbersome laboratory slide rule.
The "ATLAS" gives the Sines, Cosines, Tangents and Cotangents of all angles from 0 to 90° and reads to 1'. It gives the decimal equivalents of fractions to six figures. **15.95**

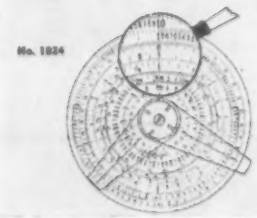


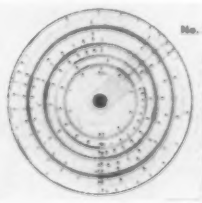
No. 1026 "BINARY" SLIDE RULE

Made of white enameled aluminum. Diameter 8 5/16", engine divided. It is equivalent of a 16-inch straight Log-Log rule. The C, CI, A, K and Log Scales are divided as closely as a 20 inch straight slide rule. The C Scale is over 25 inches long. The Spiral Log-Log Scale has four coils and extends from 1.0015 to 1,000,000.
One setting of the BINARY will give the drill size for any size top with any thread, either V. or U.S.F. The drill size can be read in 64th, .001", M.M., and letter or numbered drill. The BINARY gives the Sines, Cosines, Tangents, Cotangents of all angles from 0 to 90° and reads to 1'. It gives the decimal equivalents of fractions to six figures. **11.95**

No. 1024 "MIDGET" SLIDE RULE

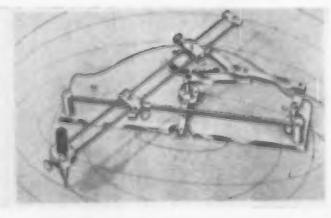
Made of white enameled aluminum. Diameter 4 ¼". Has eight Scales. C-Scale, CI, Addition and Subtraction Scale, Square Root, Log-Log, Binary, Fraction and Thread Scales, which can be used in combination to solve complicated problems. Solves any difficulties in multiplication, division, addition, subtraction and proportion and gives all possible roots and powers. **3.95**





No. 1022 "ALLEGHENY" SLIDE RULE

Made of durable laminated vinylite. Diameter 4 ¾". Has AB, CD, C1, G and L Scales. Can be used for multiplication, division, proportions, finding squares or square roots, cubes or cube roots, reciprocals and logarithms. Length of CD Scale is 10.8 inches long. On reverse side is a temperature conversion table, a decimal equivalent chart and a 360° protractor. **1.95**



ELLIPSOGRAPH

No 750—OMICRON MODEL 17

Infinite varities of Ellipses can be made easily, has a capacity of over 12 inches major axis and produces mathematically true ellipses with ease, speed and precision. Within its capacity all sizes, shapes and projections of ellipses may be drawn. Either pencil, inking pen or scriber needle may be inserted into the head. The most notable feature of this instrument is a linkage system which moves the cross guide pin on a straight line, thus eliminating all play and friction usually connected with straight line slides. This linkage produces not only accuracy but also unusual ease of operation. **14.95**

ASTRONOMY

Query Newton's Theory

Comparisons between the observed and predicted positions of the planet Jupiter suggest there may be an error in Newton's fundamental theory.

➤ NEWTON'S theory of gravitation, used to predict the motion of planets, may be wrong.

Drs. R. H. Dicke and R. Krotkov of Princeton University told the American Physical Society meeting in Washington a comparison between the observed and predicted positions of the planet Jupiter shows they do not quite agree. It is possible, they suggest, that the fundamental theory of Newton may not be "quite right."

Jupiter sometimes appears to be ahead of where it should be, sometimes behind. The difference changes regularly with time and goes through a complete cycle once every 12.4 years. The magnitude of the effect is small: Jupiter never gets out of place in its orbit by more than 600 miles.

Jupiter is so far away that this 600-mile shift, when observed by astronomers here, puts the planet out of position by only 0.00007 degrees, an angle barely measurable. The sun makes an angle of one-half a degree in the sky.

No clear indication of a similar effect has been found in the other outer planets, Saturn, Uranus and Neptune, they reported.

The reason for studying how well the best theories account for Jupiter's observed motion is, fundamentally, to see if they are correct. Such discrepancies as the small one found in Jupiter's motion have occurred frequently in the past. So far they have been explained either by a previously unsuspected systematic error in the measurements, which can then be eliminated or corrected, or by inadequate calculations of the predicted position.

Although the Newtonian theory of gravitation used to predict planetary positions is very simple in principle, the calculations involved in using it are extremely complicated. Until electronic computers were developed astronomers could never be sure their calculations were sufficiently accurate.

The calculations used by Drs. Dicke and Krotkov in their comparison of theory and experiment were done on an electronic computer by Dr. W. J. Eckert of the Watson Computing Laboratory, New York, Dr. Dirk Brouwer of Yale University Observatory and Dr. G. M. Clemence of the U. S. Naval Observatory.

The calculations are believed to give very accurately the position of Jupiter, so the small discrepancy can be explained by either an error in the measurements or, possibly, in the fundamental theory.

The cycle in which Jupiter departs from its predicted position has repeated every 12.4 years for the past 160 years. This is slightly longer than the 11.9 years required by Jupiter to revolve once around the sun. Since these two time periods are nearly equal, the error may be considered due to a steady but gradual change in the shape and orientation of Jupiter's orbit.

However, there is at present no known reason for such a gradual change to occur, Drs. Dicke and Krotkov pointed out.

Since the Newtonian theory of gravitation has successfully explained the motions of planets, scientists are reluctant to change it.

Science News Letter, May 9, 1959

PHYSICS

Rays Photographed In Luminescent Chamber

➤ TRACKS OF some of the very weak cosmic rays that reach the earth's surface from space have been photographed in a luminescent chamber for the first time.

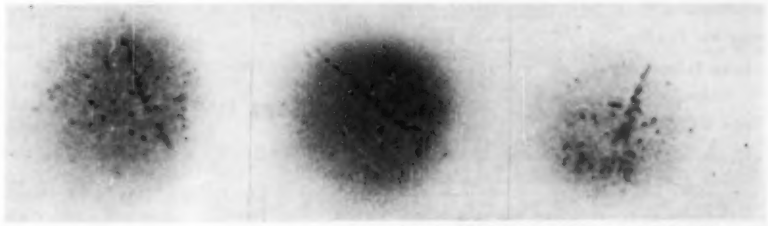
Dr. Lawrence W. Jones of the University of Michigan reported development of this new instrument for studying high energy nuclear reactions to the Physical Society meeting. With Dr. Martin L. Perl, also of Michigan, Dr. Jones found a way to record the light produced by charged particles as they pass through certain plastic and crystal materials.

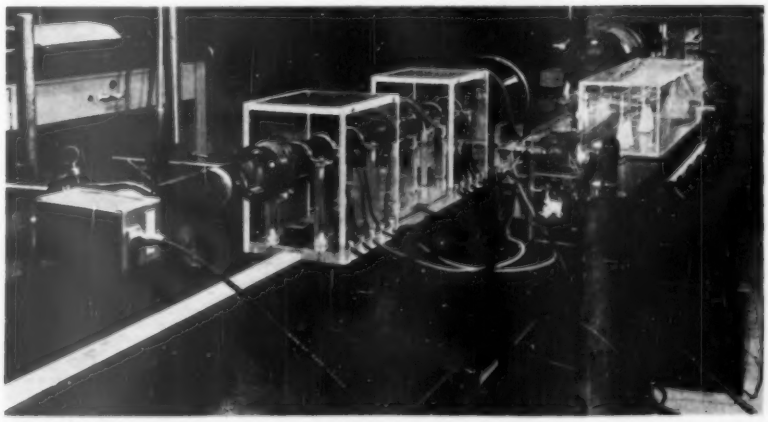
Although this light is "100,000 times too faint to be detected by the unaided eye or photographed directly," Dr. Jones said, special image intensifying electronic tubes can be used to amplify the fiant light to a level where it can be seen and recorded on photographs.

Scintillating crystals combined with image tubes thus join emulsions, cloud chambers and the more recent bubble chambers as a means of observing the tracks of charged particles.

Dr. Jones said the luminescent chamber had the added advantage of allowing an electronic "gate," or shutter, to record the reactions of particles to within intervals as short as a millionth of a second. With the large synchrotrons, or atom smashers, the device will allow scientists to do many nuclear experiments in which it is necessary not only to see where the reacting particles go in space but when the reactions occur in time.

Science News Letter, May 9, 1959





LUMINESCENT CHAMBER — Photographs of cosmic ray tracks taken with a cascade luminescent chamber made up of three image tubes coupled with refractive optics are shown (above). The dark spots are due to ion bombardment of the first cathode; gray streaks are tracks. The apparatus, viewed from the crystal end, is shown at the left. From left to right are: photomultiplier; thallium activated sodium iodide crystal; wide angle eyepiece lens; Radio Corporation of America two-stage image tube; American Optical Company special eyepiece lenses; two-stage image tube; lens; Westinghouse one-stage image tube; and photographic film.

add 3% Sales Tax.

line slides. This linkage produces not only accuracy but also unusual ease of operation. 14.95

OPTICAL BARGAINS

See the Stars, Moon, Planets Close Up!
3" REFLECTING TELESCOPE
60 to 160 Power—An Unusual Buy!

Famous Mt. Palomar Type Assembled — ready to use! You'll see the Ring of Saturn, the fascinating planet Mars, huge craters on the Moon, Star Clusters, Moons of Jupiter in detail. Galaxies! Aluminized and overcoated 3" diameter high-speed f/10 mirror. Equatorial mount with lock on both axes. An Optical Finder Telescope, always so essential, is also included. Low cost accessory eyepiece available for higher powers. Sturdy, hardwood, portable tripod. Free with scope—valuable star chart, and 272 page "Astronomy Book." Order by Stock No. Send check or M.O.—Money-back guarantee!
Stock No. 85-050-Q.....$29.95 Postpaid

4¼" ASTRONOMICAL TELESCOPE Up to 270X!

Mt. Palomar type. Up to 270 Power. A fine Reflector Telescope complete with real Equatorial Mount and Tripod and 6X Finder Aluminum tube, 4¼" dia. mirror, rack and pinion focusing eye-piece holder, 2 eyepieces and mounted Barlow Lens for 40X, 90X, 120X and 270X. Low cost accessory eyepiece available for higher powers. Shippings wt. approximately 25 lbs.
Stock No. 85-006-Q, complete, $74.50 f.o.b. Barrington, N. J.
Same Telescope as above but equipped with Electric Clock Drive—Stock No. 85-094-Q..$111.50 F.O.B. Barrington, N. J.

REPLICA GRATING
Low, Low Cost
Take Unusual Color Photos at Night

It's here—after decades of effort. Replica Grating — on film — at very low price. Breaks up white light into full spectrum colors. An exciting display. 13,400 lines per inch. Diffraction Grating has been used to answer more questions about the structure of the material world and the universe than any other single device. Use it for making spectroscopes, for experiments, as a fascinating novelty. First time available such large size—so cheaply. Comes in clear plastic protector.
Stock No. 50,202-Q...Includes 2 pieces 8" x 5½" —1 transmission type, 1 reflecting type. $2.00 Pstpd.

ERECT IMAGE LOW POWER MICROSCOPE
5X, 10X, 20X

$30 Value—Only $19.95. Extremely sturdy with rack and pinion focusing, color corrected optics, turnable microscope body for inclined viewing, three different powers, long working distance under objectives, sufficient eye relief for easy viewing. Made from war surplus optical instrument so that you actually get $80.00 of value. Weighs 4 lbs. 13" high. 10-DAY FREE TRIAL! Accessory objective available for powers of 15X, 30X, 40X.
Stock No. 70,172-Q.....$19.95 Postpaid

Take Telephoto
Shots Thru
7x50 MONOCULAR

This is fine quality, American made instrument—war surplus! Actually ½ of U.S. Govt. 7 x 50 Binocular. Used for general observation both day and night and to take fascinating telephoto shots with your camera. Brand new, $95 value. Due to Japanese competition we close these out at a bargain price. Directions and mounting hints included.
Stock No. 50,003-Q.....$15.00 Postpaid

TWO-STAGE ROCKET TOY—

Simple, safe—demonstrates principles of jet rockets. Uses water and air as fuel. First stage soars up 200 to 300 ft.—then 2nd stage is automatically released, going still higher. A 2nd stage satellite is also included and may be substituted. Made of Butyrate plastic. Set includes fuel supply tank and air injection pump.
Stock No. 70,157-Q.....$2.98 pstpd.

FREE CATALOG-Q
100 Pages! Over 1000 Bargains!

America's No. 1 source of supply for science experimenters, hobbyists. Complete line of Astronomical Telescope parts and assembled Telescopes. Also huge selection of lenses, prisms, war surplus optical instruments, parts and accessories. Telescopes, microscopes, satellite scopes, binoculars, infrared snipersccopes, items for making "Science Fair" projects, etc. Request Catalog Q. Order by Stock No.—Send Check—Satisfaction Guaranteed.

EDMUND SCIENTIFIC CO.
BARRINGTON, NEW JERSEY

PSYCHIATRY

Study Young Delinquent

➤ THE RICH MAN'S son who gets into trouble with the police or juvenile authorities is not just a completely "spoiled brat." He does not commit his offenses while following along with a gang. He is not showing off to try to gain stature with the other boys.

These and other facts were reported to the American Psychiatric Association meeting in Philadelphia by Drs. Herbert H. Herskovitz, George Spivack and Murray Levine of the Devereux Schools, Devon, Pa. These investigators made a study of all the boys enrolled in the Devereux Schools during the past five years after getting "into trouble."

Generally, their report stated, the fathers were energetic, aggressive, perfectionistic and rigid or intolerant, indifferent, ambivalent and pressuring. Mothers tended to be over-indulgent and over-protective or inconsistent. In no case did both parents completely spoil the child. In an astonishing number of cases there was evidence of family instability, including divorce or death of a parent, but very few families were troubled with alcoholism, criminality, or perversion.

Many of the boys had a history of poor conduct, truancy and defiance at school dating back as far as kindergarten but some did not start to misbehave until puberty. But it was rare that the incident that brought them to Devereux was the first intimation that the boy was in need of psychiatric help.

The offenses, committed usually when the boy was alone or with only one or two others, not a gang, were most often auto theft, burglary, vandalism, malicious mischief or sex offense.

Only one of the boys was psychotic and only one had organic brain disease. The majority were unrepentant, negative, and resisted and resented authority.

Murders by Children

➤ WHY CHILDREN commit murder was discussed at the Psychiatric Association meeting by Dr. Lauretta Bender of Creedmoor State Hospital, Queens Village, New York.

Dr. Bender described her study over a period of 25 years of 30 boys and girls aged from five to 15 years who were held responsible for the death of another person.

About a third of the boys (there was only one girl) had been examined by a psychiatrist before the death occurred. Frequently severe mental illness was found and dangerous behavior was predicted.

Nearly half the murders were caused by blows with heavy objects or shooting. They involved mostly the older boys who were affected by such severe illnesses as schizophrenia, organic brain disease or epilepsy.

The younger children were more often implicated in fire setting and drowning, in situations which appeared to be accidental and where the responsibility of the child could never be proved. Nevertheless they suffered profound grief or depression and continued for years to be preoccupied with death and their own death-dealing powers.

Five of the juvenile murderers were mentally defective; at least one third more were grossly retarded in reading.

Murder by knifing was mostly impulsive, as a rage reaction on the background of psychiatric disturbance. Murder by blows also started as an impulsive rage reaction and continued blindly. Shooting generally appeared to be calculated and planned.

Science News Letter, May 9, 1959

SCIENCE NEWS LETTER
VOL. 75 MAY 9, 1959 NO. 19

Edited by WATSON DAVIS

The Weekly Summary of Current Science, published every Saturday by SCIENCE SERVICE, Inc., 1719 N St., N.W., Washington 6, D. C., NOrth 7-2255. Cable Address: SCIENSERVC.

Subscription rates: 1 yr., $5.50; 2 yrs., $10.00; 3 yrs., $14.50; ten or more copies in one package to one address, 7½ cents per copy per week; single copy, 15 cents, more than six months old, 25 cents. No charge for foreign postage.

Change of address: Three weeks notice is required. When ordering a change please state exactly how magazine is now addressed. Your new address should include postal zone number if you have one.

Copyright © 1959 by Science Service, Inc. Republication of any portion of SCIENCE NEWS LETTER is strictly prohibited. Newspapers, magazines and other publications are invited to avail themselves of the numerous syndicated services issued by Science Service. Science Service also publishes CHEMISTRY (eight times a year) and THINGS of Science (monthly).

Printed in U.S.A. Second class postage paid at Washington, D. C. Established in mimeograph form March 13, 1922. Title registered as trademark, U. S. and Canadian Patent Offices. Indexed in Reader's Guide to Periodical Literature, Abridged Guide, and the Engineering Index. Member Audit Bureau of Circulation.

SCIENCE SERVICE

The Institution for the Popularization of Science organized 1921 as a non-profit corporation.

Board of Trustees—Nominated by the American Association for the Advancement of Science: William W. Rubey, U. S. Geological Survey; Wallace R. Brode, National Bureau of Standards; Douglas Whitaker, Rockefeller Institute for Medical Research. Nominated by the National Academy of Sciences: Harlow Shapley, Harvard College Observatory; Philip Bard, Johns Hopkins University, Henry Allen Moe, John Simon Guggenheim Memorial Foundation. Nominated by the National Research Council: Leonard Carmichael, Smithsonian Institution; John R. Dunning, Columbia University; Benjamin H. Willier, Johns Hopkins University. Nominated by the Journalistic Profession: Michael J. Ogden, Providence Journal-Bulletin; O. W. Riegel, Washington and Lee University; Lee Hills, Detroit Free Press. Nominated by the Scripps Estate: Edward J. Meeman, Memphis Press-Scimitar; Frank Ford, Washington, D. C.; Charles E. Scripps, Cincinnati, Ohio.

Officers — President: Leonard Carmichael; Vice President and Chairman of Executive Committee: Charles E. Scripps; Treasurer: Wallace R. Brode; Secretary: Watson Davis.

Staff — Director: Watson Davis. Writers: Helen Buechl, Ann Ewing, Richard Litell, Allen Long, Jane Marye, Elisabeth Mitchell, Ralph Segman, Benita Tall, Marjorie Van de Water, Howard Simons (on Nieman Fellowship Leave). Science Youth Division: Joseph H. Kraus, Dorothy Schriver, Shirley Moore. Photography: Fremont Davis. Production: Priscilla Howe, Marcia Nelson. Syndicate Sales: Hallie Jenkins. Interlingua Division in New York: Alexander Gode, 80 E. 11th St., GRamercy 3-5410. Advertising Manager: Fred A. Moulton, MEtropolitan 8-2562.

photographic film.

MEDICINE

New Treatment for Burns

➤ BLOOD FROM persons who have recovered from serious burns may be "banked" some day to save other burn victims who are fighting for their lives.

A new treatment was given to seven children badly burned Dec. 1, 1958, in the fire at Our Lady of the Angels School, a large parochial grade school in Chicago. Six of the children showed improvement. One of them had been described earlier as "hopeless." The seventh, and most severely burned child, died.

Trial of the technique was suggested by Dr. Sol Roy Rosenthal, director of the Institute for Tuberculosis Research at the University of Illinois College of Medicine. Dr. Rosenthal, currently working under contract to the U. S. Navy, has been studying human blood.

He suggested that some of the most severely burned children be given blood donated by persons who had recently recovered from bad burns. This was done, and "dramatic changes" were observed overnight, the Office of Naval Research told SCIENCE SERVICE.

The child who died had Rh negative blood and received only 150 milliliters of "convalescent burn plasma," as it is called. The other children received generally more than this. The blood was gathered in the Washington and Chicago areas on an emergency basis for use in the trial.

Dr. Rosenthal believes the rationale behind this treatment to be that a severe burn results in a release of toxic, or poisonous, material into the blood stream. This toxic material is injurious to the remote tissues of the body. The badly burned person produces antibodies slowly, often too slowly to combat the effects of these toxins on the blood and blood vessels.

Such a person may die from the toxic effects of the burn, whether or not he is severely burned. To combat this threat to the satisfactory progress of the patient, blood taken from other persons who have recovered after being badly burned is thought to be useful because it contains high amounts of antibodies against the toxins.

The treated children responded so well to the blood transfusion that Dr. Rosenthal believes blood banks should be set up to process and store blood donated by persons who have recovered from bad burns. He urges research to proceed as quickly as possible to confirm his theories, and speculates that it may be possible to prepare a vaccine from burn toxins that could be administered to generate natural immunity, reports *Naval Research* (April).

Science News Letter, May 9, 1959

PHYSIOLOGY

X-Rays Shorten Life Span

➤ RADIATION can be a major factor in causing premature aging.

Studies of fruit flies exposed to X-irradiation indicate that it is the chromosome loss produced by the X-rays that causes aging. Actually, this is evidence for a genetic basis for shortening of an animal's life span, a biologist reported to the National Academy of Sciences meeting.

While short-term effects of exposure to X-rays, such as cell destruction in the blood-forming tissues, can be traced directly back to breaks in the chromosomes' genetic material caused by radiation, it had not previously been shown that such breaks were involved in premature aging.

Dr. Irwin I. Oster of the Institute for Cancer Research, Philadelphia, explained that the fruit fly's unusual chromosome make-up gave scientists a tool for studying how radiation diminishes the average life span.

The male fly's cells contain one X-chromosome while the female's cells contain two X-chromosomes in addition to the three pairs of chromosomes which both sexes have. It had been reported earlier that male larvae are more susceptible to killing by X-rays than are female fruit fly larvae.

By using special breeding techniques, Dr. Oster said, it is now possible to introduce different type of chromosomes into the cells of otherwise normal flies. These chromosomes are more easily broken by radiation than normal ones. Following X-ray exposure, more larvae containing the "susceptible" chromosomes had their lives shortened than did the other larvae. Severely affected individuals died just before hatching from the pupa case. Dr. Oster said.

In addition, "the easily-breakable-chromosome-containing survivors were much weaker than their normal chromosome-containing counterparts," he pointed out. There is no relationship to the fly's sex except that the chromosome numbers of males and females differ.

In this study, Dr. Oster said, the chromosome difference simply provided a tool to demonstrate the effects of loss of chromosomes on the longevity of living things in general. It would be mistaken to conclude that males in other species are more easily damaged by radiation than females until it is known that loss of a partner-less chromosome—the X-chromosome in the male—is as harmful as it is for fruit flies.

Science News Letter, May 9, 1959

TECHNOLOGY

Bureau Studies Power Line Vibrations

➤ THE NATIONAL Bureau of Standards is working out ways to reduce damaging wind-caused vibrations of telephone and power lines.

Bureau researchers have found polyethylene sleeves on the wires are effective in damping out some of the vibration. Further study is expected to produce optimum sleeve sizes for various types and sizes of conductors.

Another result of the work is the redetermination of the Strouhal number, a basic constant that allows vibrations to be predicted.

These studies were started with the introduction of long-span high-tension lines by the Rural Electrification Administration, especially in the "wind belt" areas from the Dakotas to Texas and New Mexico. Vibration has caused these lines to wear at the ties and armor rods, and they frequently have broken, particularly in cold weather.

Science News Letter, May 9, 1959

METEOROLOGY

Weathermen Study Lightning Control

➤ THIS SUMMER, in the northern Rocky Mountains, weathermen will study what makes thunderstorms grow. The object is to find ways to control lightning.

The study, part of the long-term Project Skyfire, a cooperative study of lightning-caused forest fires, will consist of seeding and photographing clouds, recording electric currents and counting lightning strokes.

It will be conducted by the U. S. Weather Bureau and the U. S. Forest Service.

The northern Rocky Mountain area was chosen because rain released there from a high cloud may evaporate in the dry air and never reach the ground. It is the resulting "dry lightning" storms that cause so much fire damage to commercial forests and public playgrounds.

Eastern thunderstorms, on the other hand, are usually accompanied by heavy rains that put out any forest fires caused by the lightning.

Lightning causes about 7,500 forest fires every year in the United States at a cost of more than $25,000,000. In the northern Rocky Mountain states 70% of all fires are caused by lightning. Besides timber losses, watersheds are damaged, and national forests and parks are made unusable.

This summer silver iodide will be distributed from airplanes directly into cloud bases. This may "snip potential storms off at the top" or keep them from building up.

Scientists will also examine thunderheads by radar and place electric field meters on the ground in the usual cloud paths. Experimental models of a simple lightning-stroke counter will be tested too.

The research may yield some means of decreasing lightning or of increasing the amount of rain reaching the ground.

"So far," said DeVer Colson, Weather Bureau meteorologist, "we feel that under certain conditions we can modify the form of a cloud and its electric field, but we are not sure yet whether we have actually averted lightning."

The scientists will take steps to make certain they do not increase lightning from a given storm or create trouble elsewhere by upsetting the atmospheric balance.

Science News Letter, May 9, 1959

GEOPHYSICS

Radiation Belts Vary

➤ A VERY DIFFERENT and more intense pattern of radiation intensity in the Van Allen belts that pose a hazard to manned space travel was found by Pioneer IV, now in orbit around the sun. (See SNL, Dec. 13, 1958, p. 371.)

Dr. James A. Van Allen of the State University of Iowa, who with his co-workers first discovered the potentially dangerous radiation regions, reported this "vastly different picture" at a symposium on problems in space exploration. The symposium was sponsored by the National Academy of Sciences-National Research Council, the National Aeronautics and Space Administration and the American Physical Society.

Dr. Van Allen blamed an enormous solar outburst six days before the launching of Pioneer IV on March 3 for the increased radiation intensity and changed pattern. The solar flare resulted in brilliant auroras on several succeeding nights. More than five times as much radiation was found by the March 3 Pioneer probe as by Pioneer III, aimed for the moon Dec. 6, 1958, with insufficient speed to escape the earth's gravitational pull.

The increased radiation means manned vehicles either would have to be launched from polar sites, since the Van Allen belts leave a 20-degree escape cone at each pole, or would have to stay earth-bound until the solar outburst effects had subsided.

A lead-shielded Geiger counter aboard Pioneer IV was planned by the Iowa physicists to measure the intensities and extent of the radiation belts, which are centered on the earth's magnetic equator and hang suspended like giant doughnuts in space.

The outer radiation zone, Dr. Van Allen reported, was found by Pioneer IV to extend to 52,250 miles from the earth's surface, 18,750 miles farther than shown by Pioneer III. The shielded counter showed that the inner radiation zone contained predominantly quite penetrating radiation, while that in the outer zone was virtually completely absorbed by the lead shielding.

Dr. Van Allen proposed that the inner zone radiation consists primarily of decay products of neutrons emerging from the earth's atmosphere. The outer radiation zone is believed due to solar gas and is of much lower average energy.

The inner belt begins at about 1,300 miles and extends to about 3,000 miles from the earth's surface; it is about 4,000 miles wide from north to south. The outer belt begins some 8,000 miles up and extends to about 52,250 miles; it is about 20,000 miles wide from north to south.

Science News Letter, May 9, 1959

PSYCHIATRY

Isolation Poses Problem

Space travel and long voyages in atomic-powered submarines will place unusual stresses upon crews with isolation perhaps the most important of these.

➤ WITH NUCLEAR power the submarine service has become more than ever the "Silent Service," presenting a new challenge to the minds and emotional stability of the crew.

Since World War II, the job of the submarine has changed completely. Patrol times may be extended from the average 40 days of the last World War to 100 days or more, more than three months.

The effects that service on the nuclear submarine may have on the crew were described to the American Psychiatric Association at Philadelphia by the medical officer on the Seawolf, John E. Ebersole.

The submarine in future will no longer be a destroyer of merchant ships; it will be used to hunt and sink enemy submarines. This will mean hovering perhaps for weeks at great depths keeping on the alert listening for an enemy sub. Since noise must be avoided, most equipment will be shut down or operating at low power levels. This will include air conditioning and air revitalization equipment.

Sea noise may cause repeated false alarms that the enemy is near. This will cause a stress for the crew in addition to fatigue, monotony, the stress of bad air, and the natural fear caused by living and working within feet of a nuclear reactor.

The crew of 116 men stood up remarkably well under this sort of stress during the 60 days of continuous submergence in the Seawolf, Dr. Ebersole said.

No special selection procedure was used for this patrol and no particular psychological testing was carried out during the tour of duty.

But the officers noted no falling off in performance of the men. Although the men were somewhat anxious about their families during the long period without communication, they handled their worries well. Verbal badinage was common but it was not especially aggressive. Physical aggression was unknown. There was a marked susceptibility to rumor about lengthening or shortening the patrol period. The men were not depressed. Except for the separation from family they did not complain of feeling isolated.

Psychiatry of Space

➤ THE MAN WHO can tolerate the barren loneliness of outer space the best is the withdrawn highbrow who lacks warm human relationships.

This conclusion was reported to the Association by Dr. Henry U. Grunebaum, Boston University School of Medicine, Dr. Sanford J. Freedman of the Isolation Laboratory, Massachusetts Mental Health Center, Boston, and Dr. Milton Greenblatt of Harvard Medical School.

Confined for eight hours in a small isolation chamber unable to see, hear anything but a hissing noise, or touch anything, these repressed, passive people found the experience actually pleasant and were not disturbed by it.

Those who found the isolation most disturbing, became increasingly anxious and had frightening fantasies were two borderline psychotics.

Most of the subjects had striking perceptual aberrations when tested after the experiment. Straight lines appeared to move, triangles seemed to change shape, haloes developed, and figures became larger or smaller.

They also experienced during the experiment a flow of hallucination-like images that were striking and colorful, similar to what sometimes occurs just before falling asleep. The extent of this imagery may be related to artistic talent, it was found.

Although the withdrawn "schizoid" individuals came through the experiment better than other types of personality, they may not be selected to go into space. It is not known whether they would be able to work in isolation; the space pilot will be required to.

Space Research Dangers

➤ SERIOUS PLANS to send a man into outer space have brought on a rash of experiments dealing with the effects on the human mind of isolation and sensory deprivation such as might be faced by the man in a space capsule.

Such an experience, even when it is comparatively brief and "easy," brings on in the human subject an artificial temporary neurosis, Duke University experimenters reported to the Psychiatric Association.

What is the responsibility of the experimenter toward the subject whose mind or personality is thus damaged, even if briefly, the Duke scientists asked their colleagues.

The scientists urged that some of the research funds for such experiments be set aside for follow-up and therapy, if necessary, for the subjects thus exposed to artificial neuroses.

The Duke group reporting included Drs. Bernard Bressler, Albert J. Silverman, and Sanford I. Cohen of the Psychophysiology Laboratory.

Science News Letter, May 9, 1959

PHYSICS

Earth Has Hydrogen Halo

New calculations indicate that the earth is surrounded by an invisible halo of hydrogen which begins at about 600 miles above the planet's surface and extends 20,000 miles.

➤ THE EARTH is surrounded by an invisible halo of neutral hydrogen extending some 20,000 miles or more in space.

Each atom in the halo follows a path like that of a ballistic missile, Dr. S. F. Singer, University of Maryland physics professor, reported. He told the American Physical Society meeting in Washington, that the outermost layer of the earth's high atmosphere, termed the exosphere, starts at 300 miles above the surface.

The higher in the atmosphere a particle is, the longer the distance it can travel before it hits another particle. Scientists say its "mean free path" becomes larger with increasing altitude. For instance, at sea level the concentration of air atoms and molecules is ten raised to the 19th power, or one followed by 19 zeros, in each cubic centimeter. At a height of 300 miles, Dr. Singer calculated, the concentration is only 10,000,000, or one followed by seven zeros, in a cubic centimeter.

At the 300-mile altitude, the "mean free path" has become so long that particles moving in a generally upward direction have a good chance of not hitting any other atmospheric atoms at all and could go out into space.

Whether a particle does or not depends on its velocity. If its velocity is less than the approximately seven miles per second needed to escape earth's gravitational field, it will go out to a very high altitude, then fall back toward the earth. Its path will resemble that of the first Pioneer rocket, which did not escape from earth.

If its velocity is more than seven miles a second, the atom will escape into space and be forever lost to the earth.

Dr. Singer has calculated from a new theory the concentration of particles to be expected in the exosphere. He finds that heavy atoms likes oxygen cannot extend very far out. At about 600 miles above the surface, hydrogen takes over as the most important constituent of the exosphere because it has the lowest atomic weight. The earth is therefore surrounded by a neutral hydrogen halo that moves with it as the earth revolves around the sun.

The density distribution computed by Dr. Singer differs considerably from previous calculations, and shows in general a much slower decrease of density with altitude than previous models. Dr. Singer suggested that the temperature at 300 miles is 1,500 degrees absolute, or about 3,200 degrees Fahrenheit.

Science News Letter, May 9, 1959

ASTRONAUTICS

Moon Rocket Planned

Vega, a three-stage, 1,000-pound moon rocket, is being developed by the National Aeronautics and Space Administration. It could be used to put equipment into orbit.

➤ THE NATIONAL Aeronautics and Space Administration is developing a satellite-launching rocket capable of sending about 1,000 pounds near the moon.

The three-stage vehicle, known as the Vega, would also make it possible to put several tons of equipment in a 300-mile orbit around the earth. Dr. Homer E. Newell, NASA's assistant director for space sciences, reported plans for Vega and other future launching rockets at a symposium on problems in space exploration.

The symposium was sponsored by NASA, the American Physical Society and the National Academy of Sciences-National Research Council. Dr. Newell said the Vega will use a modified Convair-Atlas as the first stage. The second stage will be a modified General Electric engine that was used as the Vanguard first stage. The third stage will be a Jet Propulsion Laboratory rocket using storable propellants.

Dr. Newell also reported that NASA is developing a four-stage solid propellant satellite vehicle capable of carrying about 150 pounds into a 300-mile orbit. Called the Scout, this rocket will be much more economical than existing vehicles, and is expected to be used in the U. S. program for cooperation with other nations in space research.

NASA has recently offered to launch a satellite for the Committee on Space Research (COSPAR) of the International Council of Scientific Unions, Dr. Newell said.

Future rockets beyond the Scout and Vega, Dr. Newell reported, include the Centaur, Saturn and Nova. Centaur is similar to the Vega except that the second stage will use high energy propellants.

The first stage of the Saturn vehicle, being developed by the Army Ballistic Missile Agency, will use a cluster of existing rocket engines to give more than a million pounds of thrust. The Nova rocket will be based on a single chamber rocket of more than a million pounds thrust being developed by the Rocketdyne Division of North American.

The U. S. space science program, Dr. Newell said, depends upon the available rockets and their performance capabilities. With the vehicles now under development, it will be possible to undertake not only satellite missions in earth's vicinity but probe missions to the moon and nearer planets and space exploration out to many, many millions of miles.

To accomplish this, Dr. Newell stressed that it is "absolutely essential" to have the support and participation of the scientific community. The NASA space science program is divided into seven categories: atmospheres, ionospheres, energetic particles, electric and magnetic fields, gravitational fields, astronomy and bio-sciences.

Science News Letter, May 9, 1959

PALEONTOLOGY

"Living Fossil" Found Off Baja California

➤ A RARE "living fossil" has been hauled out of the sea by a research party from Scripps Institution of Oceanography off the tip of Baja California.

The creature, known as Neopilina, is a small single-shelled mollusk that lives at great ocean depths. Fossilized shells of similar mollusks have been found only twice previously, in New York State and in Sweden. (See SNL, Dec. 27, 1958, p. 408.)

This latest Scripps discovery included three specimens hauled from a depth of 8,600 feet near Cape San Lucas. News of the discovery was radioed to the Institution by Dr. Francis P. Shepard, leader of the Scripps Vermilion Sea Expedition.

The structure of Neopilina shows it is much like the annelids, or segmented worms. This indicates a possible relationship to the annelids.

From previous studies of the fossils alone, prior to the discovery of the living form, scientists had deduced that Neopilina must have had soft parts at the time it was known to have lived 300,000,000 years ago.

The newly found mollusks verified these scientific deductions.

Science News Letter, May 9, 1959

GENERAL SCIENCE

New Wing for Academy To Be Given By Society

See Front Cover

➤ A NEW WING will provide housing for the many scientific activities of the National Academy of Sciences and its National Research Council in the fields of biology and medicine.

The photograph on the cover of this week's SCIENCE NEWS LETTER is an architect's drawing of the new annex. A gift from the Equitable Life Assurance Society of the United States will make possible its construction. The Society is celebrating its 100th anniversary.

Science News Letter, May 9, 1959

PSYCHIATRY

Monkeys Can Be Affected By Subliminal Perception

➤ EVEN A MONKEY may be affected by being shown a symbol of which he is not aware.

The technique known to scientists as subliminal perception, and to advertisers as the "secret sell," apparently is effective with monkeys. However, the outward behavior of the monkey is not changed at all, Drs. I. Arthur Mirsky and Robert E. Miller of the University of Pittsburgh School of Medicine reported to the American Psychiatric Association meeting in Philadelphia.

The animal was first conditioned by showing him the symbol at the same time that he received a painful electric shock. The animal learned to avoid the electric shock by pressing a bar lever as soon as he saw the symbol. The monkey's heart, which beat faster when the shock was applied, soon would speed up also when only the symbol was presented.

Then the experimenters shortened the exposure time of the symbol until it was flashed before the animal for only thousandths of a second.

The animal's heart beat faster when the symbol was shown so briefly that he failed to press the lever—apparently was not aware of the symbol. Although the monkey was inwardly affected by the "invisible" symbol, his outward behavior was not changed.

The monkey is able to read the expression of other monkeys, these experiments showed. If one animal is frightened, he can communicate the fear to another monkey. Even color photographs of a fearful monkey can cause fear in the monkey that looks at them.

Science News Letter, May 9, 1959

TECHNOLOGY

Process Converts Textiles Directly to Pure Graphite

➤ GRAPHITE CAN now be produced in flexible fibers and woven fabrics. A new process has been developed that converts organic yarns, braids and felts directly to graphite with a 99% purity.

Experimental quantities of graphite cloth are being evaluated as reinforcing agents for various plastics and refractory materials used at high temperatures, such as in nose cones of space missiles.

Graphite fibers may also be used to impart electrical and heat conductivity to nonconducting materials such as plastics, ceramics and glass cloth.

The complex process, developed by National Carbon Company, division of Union Carbide Corporation, is a thermo-chemical conversion in which a fiber or fabric, such as rayon, is graphitized by electrically heating it to a temperature near 5,400 degrees Fahrenheit.

In this way the crystalline structure of the material is made to resemble conventional graphite used in electric furnace electrodes, nuclear reactor structures, and other industrial jobs.

The combination of properties and available forms makes chemical, electrical and mechanical applications of graphite textile forms virtually limitless.

At ordinary pressures, graphite has no melting point and sublimes (goes directly from the solid to the vapor state) only at extremely high temperatures. Furthermore, graphite gets stronger at higher temperatures. Its tensile strength at 4,500 degrees Fahrenheit is about twice that at room temperature.

Graphite textiles are resistant to attack by acids, alkalies, and organic compounds, except for those of a highly oxidizing nature, and are unreactive with many molten metals.

They have excellent electric and heat-carrying properties and are immune to thermal shock. Graphite also has useful lubricating qualities.

Science News Letter, May 9, 1959

PHYSICS

More A-Bomb Explosions High in Air Suggested

➤ THE UNITED STATES will explode more atomic bombs high in the atmosphere to create artificial auroras, to gather information on the earth's magnetic field and other geophyscial effects, if the hopes of the father of Project Argus are realized.

Nicholas C. Christofilos of the University of California, Livermore, Calif., told the National Academy of Sciences meeting in Washington, D. C., that more experiments of the Project Argus type would be of importance in studying the behavior of the earth's outer atmosphere. (See SNL, March 28, p. 195.)

The suggested experiments would be a follow-up to Project Argus, in which three small atomic bombs were exploded at a height of 300 miles over the South Atlantic late last summer.

Project Argus yielded much valuable information about how electrons, negatively charged particles, behave in the earth's magnetic field. Electrons released by the A-bomb tests formed a shell around the earth that remained for several days in a relatively fixed position in space.

Mr. Christofilos considers high altitude atomic tests an important tool for probing the earth's magnetic and electric fields, and the structure of the very rarefied atmosphere hundreds of miles in space. Information gathered by Project Argus has proved very useful in studying and interpreting the natural radiation belts discovered by Dr. James A. Van Allen and his co-workers at the State University of Iowa from flights of Explorer satellites through the concentrated radiation regions.

The explosion of small bombs in outer space is completely harmless as far as creating a radiation hazard is concerned, Mr. Christofilos said. However, he warned, explosions of megaton bombs can create radiation hazards. Even a one megaton bomb exploded in the proper location in outer space would deliver to a man in a satellite a deadly dose, some 400 roentgens, in less than three hours.

Science News Letter, May 9, 1959

IN SCIEN

PUBLIC HEALTH

Forecast 25% Increase In Air's Carbon Dioxide

➤ A 25% INCREASE in the amount of carbon dioxide in the earth's atmosphere during the 150-year period ending in 2000 A.D. has been forecast.

Dr. Bert Bolin of the University of Stockholm in Sweden told the National Academy of Sciences meeting in Washington that the burning of coal, oil and gas was adding carbon dioxide to the air at about one-half a percent each year. This is such a rapid rate the increase will be easily detected within a few years.

The increase in carbon dioxide in the atmosphere during the last 100 years, he said, is much more likely to be about eight percent than the usually quoted two percent. Carbon dioxide is believed the cause for earth's suspected warming trend of two to three degrees Fahrenheit in the last 50 years. It acts like the glass in a greenhouse to keep heat from escaping into space but allowing the sun's rays to pass.

Dr. Bolin said the application of his new figure to future climate changes is not well understood and called for further studies of the effects of carbon dioxide in the atmosphere.

Dr. Bolin's new rate for carbon dioxide addition is based on an examination of how this chemical affects the ability of ocean water to absorb it after a certain amount has been added. By doing this, Dr. Bolin said he had reconciled the two different values quoted for the increase in atmospheric carbon dioxide during the last 100 years.

The two percent value is based on comparisons of the radioactive carbon-14 compared to the usual form, carbon-12. The less reliable direct measurements give ten percent.

Science News Letter, May 9, 1959

ASTRONOMY

New Group Appointed To Study Moon's Surface

➤ LONG-RANGE scientific explorations of the moon's surface and environment will be conducted by a new group appointed by the National Aeronautics and Space Administration.

The group, which will be headed by Dr. Robert Jastrow of NASA, will correlate experiments in the general areas of probes and orbiters, advanced orbiters, hard landings, and soft landings. Other such working groups on satellite beacons and orbiting astronomical observatories have previously been announced by NASA.

Science News Letter, May 9, 1959

CE FIELDS

AGRICULTURE

Gibberellic Acid Increases Uplands Pasture Grass

➤ GIBBERELLIC acid, the plant growth promoting substance, may be a boon to the livestock owner.

Research reported by two Australian scientists indicates that gibberellic acid can increase winter growth of pasture grass and clover significantly. Also, they report, there appears to have been no harmful effect on the health or live weight of sheep fed the treated grass.

"The problem of restricted winter growth of pastures is of agronomic importance in countries in high latitudes and in the uplands of certain others," the scientists point out. Gibberellic acid may become an important factor in increasing pasturage. They found that treated plots gave a higher yield of both clover and grass after the first two monthly harvests.

After the third harvest, grass yield was as high as in untreated plots, but the clover yield was down. Both clover and grass yields were lower than the control plots after the fourth harvest.

Details of the study, carried out by G. Scurfield and E. F. Biddiscombe of the division of plant industry, Commonwealth Scientific and Industrial Research Organization, Canberra, appear in *Nature* (April 25).

Science News Letter, May 9, 1959

ENDOCRINOLOGY

Enzymes Key To Human Diseases

➤ CHANGES in the large molecules in the human body, nucleic acids, sugars and proteins or enzymes, are suspected as the root of inherited diseases.

Sensitivity to primaquine, an antimalarial drug, is one gene-determined defect that is receiving intensive study, Dr. H. N. Kirkman told a symposium. Persons with primaquine sensitivity develop hemolytic anemia after eating fava beans.

Some diseases are characterized by the inactivity of a certain enzyme necessary for specific chemical steps to take place in the body, the National Institutes of Health researcher said. However, it is necessary to determine whether the enzyme is actually absent or is too defective to function.

Previous investigators have found that the red blood cells of affected persons have only five percent to 20% the activity of the enzyme glucose-6-phosphate dehydrogenase. Dr. Kirkman reported that he has been able to extract the enzyme in a partially purified form from human red blood cells.

Comparison of the catalytic activity of the enzyme in normal and in primaquine-sensitive persons' blood revealed no qualitative difference between the two enzymes. Apparently the enzyme inactivity in disease-susceptible persons is due neither to molecular "warping" of the enzyme nor to a removable inhibitor, Dr. Kirkman said.

Further purification and studies of the enzyme are in progress, he told a symposium on molecular genetics and human disease meeting in Syracuse, N. Y.

Another study of the role of glucose-6-phosphatase has contributed a further link in the chain of events that connects the altered blood glucose of the diabetic with this enzyme's activity.

It had already been known that diabetic rats' liver cells contained about twice as much of this enzyme as normal rats' liver cells. The mechanism of this over-activity was unknown, however. Now research by Dr. H. L. Segal of the department of biochemistry at the University of Pittsburgh indicates that a change takes place in the microsome, not in the enzyme itself.

Exactly what change takes place in the diabetics' microsomes—the so-called "protein factories" found in all living cells—is still unknown. However, by removing the glucose-6-phosphatase from the microsomes and finding that differences persisted between diabetic and normal animals, Dr. Segal and his associates have pinpointed the trouble spot.

Details of the techniques used in the studies of rat liver glucose-6-phosphatase were reported at the recent annual meeting of the Federation of American Societies for Experimental Biology.

Science News Letter, May 9, 1959

PHYSICS

Newsletter Will Publish Nuclear Physics Data

➤ A NEWSLETTER that will quickly spread among scientists the latest information from studies in high energy nuclear physics is being supported by the National Science Foundation.

The Foundation has granted $7,000, matching an equal contribution from Soviet Russia, to establish this needed new publication. The grant is part of a program to further international scientific cooperation.

High energy physics studies concern the frontier of atomic probings, the structure and particles making up the nucleus. Such nuclear information is garnered both from tracks left in photographic emulsions by the powerful cosmic rays continuously bombarding the earth from space and from atom smashers, the giant machines that accelerate elementary particles to energies near the speed of light.

The newsletter is expected to begin publication shortly in Geneva, Switzerland, with the assistance also of the International Union of Pure and Applied Physics and the European Organization for Nuclear Research (CERN).

It will provide a rapid and economical means for exchange of information between scientists of all nations, helping to prevent expensive duplication of effort and facilities in instrumentation and in accelerator development. The Foundation's grant was made through the National Academy of Sciences-National Research Council.

Science News Letter, May 9, 1959

MEDICINE

Doctors Now Wear TV Camera to Teach

➤ NOW THERE is a special television camera for doctors—they wear it on their heads.

A small camera has been devised to solve the difficult medical problem of showing students critical areas within the ears, nose, throat and other body cavities.

A pilot model of the camera has already been used in ear, nose and throat teaching, Drs. Paul Moore and Hans von Leden of Northwestern University Medical School report in the *Journal of the American Medical Association* (April 25).

Normally, only one person can look into a body cavity at one time. The problem in the past has been solved through the use of mirrors, which allows one other person to see. Ordinary photography prevents the students from seeing the area at the time the examination is done.

This TV camera allows the examiner to see the field clearly, allows a normal range of motion for the examiner, and permits others to see on a television screen the very same area the examiner sees, the doctors said.

The camera itself is mounted on a helmet made of fibrous glass. A periscope is attached to the camera. The mirror and lens system of the periscope is so constructed that the image is reflected upward to the camera lens while allowing the same image to pass through to the eye of the examiner.

Mirrors or a small lamp attached to the periscope provide a source of light. The pilot model still needs some modification, the inventors said. They hope eventually to provide colored pictures that would help show the natural features of the areas being examined.

Science News Letter, May 9, 1959

BIOCHEMISTRY

Cod-Liver Oil Is Potent Cholesterol Lowerer

➤ IN CONTRAST to animal fats which increase the serum cholesterol level in the body, oil from marine animals—seals, sardines, whales—seems to lower the level.

Since cholesterol is believed to be associated with atherosclerosis, research reported on the potent cholesterol level reducing activity of cod-liver oil may be important in human medicine. It is more potent than some vegetable fats tested.

Rats fed a diet of starch to which cholesterol and coconut oil were added received both corn oil and cod-liver oil as dietary fats. The fish oil, report A. P. de Groot of the Central Institute for Nutrition and Food Research, Utrecht, and S. A. Reed of the Marfleet Refining Co., Ltd., Hull, had a higher cholesterol-lowering activity.

The fatty acid fraction accounts for most if not all of the activity, the scientists report in *Nature* (April 25).

Science News Letter, May 9, 1959

ENGINEERING

Bridges Made Safe

It has taken a major catastrophe and several near disasters to stimulate the development of bridge aerodynamics which is making bridges safe.

By RALPH SEGMAN

➤ ON A WINDY November morning, the engineer in charge of the Tacoma Narrows Bridge rushed to the telephone. Alarmed at the rhythmic rise and fall of the 2,800-foot suspension span (the third longest in the world), he ordered stiffening wire ropes for immediate installation. When he returned, the span was gone.

Out of this death in 1940 of a four-month-old engineering masterpiece came the phoenix-like birth of a new science, bridge aerodynamics.

In less than two decades, the science has reached perhaps its ultimate expression in the new Straits of Mackinac Bridge in upper Michigan. The bridge is the first utilizing the concept of "perfect aerodynamic stability."

The world's longest suspension bridge, 8,614 feet from anchorage to anchorage, "Big Mac" can withstand virtually infinite wind velocity. Even with its deck openings shut solid by ice and snow, it could shrug off a 632-mile-an-hour wind, a blow that is far beyond what might occur. What is more remarkable is this: the stronger the blow, the more rigid and resisting the bridge becomes.

Tragic Lesson

The lesson learned from the Tacoma collapse had been a shocking one to bridge engineers who venerated the principle of flexibility in suspension spans. The Tacoma Bridge was the most flexible ever built and was hailed as one of the safest.

During its construction the motions of the span, even in gentle breezes, caused "seasickness" among the rugged workers. Yet, the supreme confidence of authorities, designers and builders was not shaken. Motorists seemed to enjoy the bouncing, swaying ride on the bridge they dubbed "Galloping Gertie."

Then came the 42-mile-an-hour wind, violent up-and-down oscillations and writhing. Like a narrow wooden ruler being twisted in opposite directions at each end, the span snapped. Tearing away from suspending cables, it crashed into Puget Sound more than 200 feet below.

The catastrophe was not unexpected to Dr. David B. Steinman, designer of hundreds of bridges, among them the Mackinac. He had previously suggested that the span be stiffened.

Before most of his profession had recognized aerodynamic oscillations as a problem, Dr. Steinman had begun to work on the solution. He recently said that some 20 bridges completed since 1930 have been subjected to disturbing or dangerous oscillations. At least two of them, the Golden Gate and the Bronx-Whitestone, have undergone costly stiffening reconstruction.

Dr. Steinman credits John A. Roebling, designer of the Brooklyn Bridge more than 90 years ago, as being the first man to do something about aerodynamic instability. With an intuitive rather than scientific grasp of the problem, Roebling built his suspension spans using special stiffening methods. For nearly three-quarters of a century thereafter, this phase of bridge building was totally ignored.

Mere stiffening is not the best way to build large and safe suspension bridges. Dr. Steinman maintains that it is both more scientific and more economical to eliminate the cause of aerodynamic instability than to build heavy powerful structures to resist the force of the wind.

It is surprising that aerodynamics was not applied to bridges sooner since it has been utilized by aircraft designers from the beginning of the air age. Wings are shaped in such a way that the airflow around them produces a greater pressure on the under surface, thus a lifting force.

Similar forces act on bridge roadways which are supported by cables from above and a network of steel girders below. In a steady wind, the flexible span tends to oscillate up and down in harmony with the air pressure which acts rhythmically to force it up and then down. These oscillations are self-exciting and may, in a short time, become violent in non-aerodynamic bridges.

Dr. Steinman can demonstrate this effect. Mounting half a solid sphere between two light springs he exposes the flat side to a stream of air from an electric fan. He pulls the half-sphere up or down slightly and lets go. The resulting small oscillation rapidly builds up into a violent one. When the round side of the half-sphere faces the fan, any oscillation that is started promptly damps out.

Employing this "round-side" principle, Dr. Steinman designed the Mackinac Bridge. As he described it:

"When the bridge floor is moving up, the resultant aerodynamic forces act down; and vice versa. As a result, any incipient vibration (as from traffic) is quickly brought to rest. The bridge actually utilizes the force of the wind to produce stability; the stronger the wind, the more stable the bridge!"

As an added safety factor, the two inner traffic lanes are constructed of open steel grillwork, thus eliminating some of the solid surface that otherwise would be exposed to wind pressures. For the same reason, there are open slots at the far edges of the outer lanes.

Dr. Steinman believes that the design of the Mackinac Bridge permitted a saving of $15,000,000 in its construction (its total cost was nearly $100,000,000).

The finished structure represents to him a triumph of mathematics applied to bridge design and a symbol of future bridges.

A generation ago, Dr. Steinman said, the feasibility of suspension spans of 3,000 feet was seriously questioned. Today, the world's longest span, the Golden Gate Bridge, extends 4,200 feet. The Mackinac's span is 3,800 feet, the George Washington's is 3,500 feet and the new Tacoma Narrows (aerodynamically safe) span is 2,800 feet.

A span 5,000 feet long has been designed to cross over the Messina Straits between Italy and Sicily. A 6,300-footer is in the planning stage, and Dr. Steinman predicts suspended spans as long as 10,000 feet.

In addition to suspension spans, used primarily to bridge deep waters, there are

"BIG MAC"—With the world's second longest span, 3,800 feet, the new Straits of Mackinac Bridge is built to shrug off the most powerful winds ever recorded. Considered the safest suspension bridge, it is also the longest, from anchorage to anchorage.

some 20 other types of bridges. Development of long spans for them has created an urgent need for improved materials. There now are alloy steels, heat-treated carbon steels and cold-drawn high-carbon bridge wire. Some materials already have three or four times the safe working strength of ordinary steel. The principal lightweight material is structural aluminum. One of the newer materials is prestressed concrete, or concrete compressed and strengthened by pre-stretched steel wires running through its length.

Among the most recent structures are:

The Greater New Orleans Expressway. The longest highway bridge in the world, extending 24 miles across Lake Pontchartrain, it is made of hundreds of 56-foot prestressed concrete spans and two movable bascule spans.

The Tappan Zee Bridge. Carrying New York Thruway traffic more than three miles across the Hudson River, this bridge employs the cantilever principle. Its 1,212-foot main span rests like a board lying across the gap between two seesaws standing end to end. Its weight is balanced by counterweights on the far ends of the "see saws."

The Nagasaki-Sasebo Bridge. Built in Japan, this steel arch bridge has a 1,042-foot span, the fourth longest of its type. The roadway is supported by the arch which stretches from shore to shore.

The New South Capitol Street Bridge. Crossing the Anacostia River in Washington, D. C., it has the world's longest plate-girder bascule span, 386 feet. A bascule span is one which allows ships to pass by swinging up and open like the flaps of a box.

These examples are indicative of the tremendous increase in bridges of all kinds. The growing American turnpike system has added hundreds of bridges, large and small. The impelling demands of industrial expansion and motor travel have brought almost complete extinction to the era of the ferryboat.

Science News Letter, May 9, 1959

Questions

ASTRONOMY—Study of what planet indicated inaccuracies in Newton's theory? p. 291.

MEDICINE—What is one new method for treating severe burns? p. 293.

PHYSICS—Why does hydrogen take over as the most important constituent of the exosphere at about 600 miles? p. 295.

Photographs: Cover, Equitable Life Assurance Society of the United States; p. 291, Lawrence W. Jones; p. 298, Mackinac Bridge Authority; p. 304, Union Carbide Plastics Co.

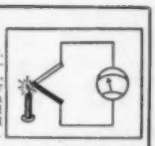
Do You Know

Short-lived blue supergiant *stars*, 6,000 times brighter than the sun, may give clues to the evolution of our stellar systems.

Boron-phosphorus compounds that may lead to the development of heat-stable *plastics* have been synthesized.

THERMO-ELECTRONICS

Successor to thermo-electricity. Change heat to electricity DIRECTLY—no acids, liquids, chemicals, moving parts or sunlight! Build or buy a thermo-electronic battery. Mail 25¢ today for information and sample thermo-electronic alloy.



HERMON E. COTTER Dept. H. 15766 Blackstone, Detroit 23, Mich.

AUTHENTIC CIRCULAR SLIDE RULE KEY CHAIN

Precision calibrated and tridium plated, size of a silver dollar. Simple to use, instructions included for square roots, percentages, multiplication and division. Money-back guarantee. $3.00 Ppd. (Californians add 4% tax)

MARK COMPANY
PO Box 24084,
West Los Angeles, Calif.

MATHEMATICS FOR EVERYMAN

From Simple Numbers to the Calculus

Egmont Colerus, the author, is one of that all-too-small band of gifted teachers who know how to COMMUNICATE mathematics.

Once caught in his "trap" there is no escape—one is compelled to go on at least as far as the calculus, with fascinating glimpses of mathematical history and philosophy along the way.

Little or no previous knowledge of mathematics is assumed. Every point is illustrated with an example. Such is Colerus' talent that long before the reader knows what is happening, he finds, amazingly, that he has acquired a ready grasp of the fundamentals of mathematical operations and mathematical reasoning. More, some of the magic, the greatness, the beauty of the science has somehow rubbed off onto him, to his permanent enrichment. Illustrations throughout.

ORDER NOW!

MATHEMATICS FOR EVERYMAN
by Egmont Colerus

$3.95 Postfree • 10-Day Money-Back Guarantee

EMERSON BOOKS, Inc., Dept. 679-L
251 West 19th Street, New York 11

Super Jet Blowtorch

For glass blowing, soldering and many other household uses.

• LIFETIME GUARANTEE •

$2.98 Complete with 12 refills. Additional refills—12 for 35¢.

Send Check or Money Order to:

WINN CHEMICALS
124 West 23 St., New York 11, N. Y.

LINGUAPHONE
MAKES IT EASY TO LISTEN and LEARN to *Speak*

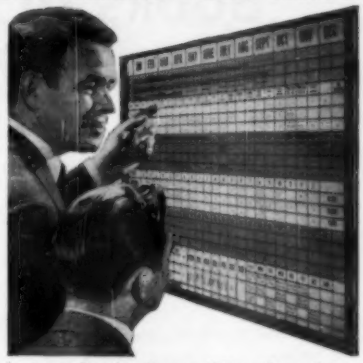
SPANISH (American or European) • **FRENCH**
GERMAN • **ITALIAN** • **JAPANESE**
MODERN GREEK • **RUSSIAN** • **ICELANDIC**
—any of 34 languages available AT HOME

Only Linguaphone, The World's Standard **Conversational** Method, brings 8 to 12 of the world's best native language teachers **into your home.**

You listen to life-like, **conversational** recordings for just 20 minutes a day. You hear men and women speak—YOU Understand—You SPEAK. Over a million home-study students of all ages have learned another language this ideal way. Write today for FREE Book and details of FREE TRIAL. No obligation.

Linguaphone Institute, T-31-059 Radio City, New York 20, N. Y.

You Get Things Done With Boardmaster Visual Control



☆ **Gives Graphic Picture of Your Operations—Spotlighted by Color**
☆ **Facts at a glance — Saves Time, Saves Money, Prevents Errors**
☆ **Simple to operate — Type or Write on Cards, Snap in Grooves**
☆ **Ideal for Production, Traffic, Inventory, Scheduling, Sales, Etc.**
☆ **Made of Metal. Compact and Attractive. Over 350,000 in Use**

Complete price $49.50 including cards

FREE 24-PAGE BOOKLET NO. V-20 Without Obligation

Write for Your Copy Today

GRAPHIC SYSTEMS
55 West 42nd Street • New York 36, N. Y.

THE ROMANCE OF CHEMISTRY

From Ancient Alchemy to Nuclear Fission
By KEITH GORDON IRWIN
Illustrated by Anthony Ravielli

The lives and works of the great men of chemistry—Robert Boyle, Antoine Lavoisier, Robert Bunsen, and many others. The story spans the centuries, from the days when men searched for the elusive "philosopher's stone," with which to transmute base metal to gold, to modern times, when atoms are actually being created artificially from certain other atoms. Handsome full-page drawings. $3.75

•

Written and illustrated by
Keith Gordon Irwin

THE ROMANCE OF WRITING:
From Egyptian Hieroglyphics to Modern Letters, Numbers, and Signs . . . $3.75

•

THE VIKING PRESS
New York 22, N. Y.

• Books of the Week •

For the editorial information of our readers, books received for review since last week's issue are listed. For convenient purchase of any U. S. book in print, send a remittance to cover retail price (postage will be paid) to Book Department, Science Service, 1719 N Street, N.W., Washington 6, D. C. Request free publications direct from publisher, not from Science Service.

ATOMIC RADIATION IN THE HIGH SCHOOL SCIENCE CLASS — Joe W. Tyson — *Oldfriends' Books*, 87 p., paper, $1.65. Compilation of materials from many sources for inclusion in high school studies. Experiments suggested are "no more dangerous than those of the chemistry laboratory."

THE BIRD LIFE OF GREAT SALT LAKE—William H. Behle—*Univ. of Utah Press*, 203 p., illus., $4.50. The life history, ecology and population trends of the California gulls, white pelicans, double-crested cormorants and great blue herons.

CAREER 1959: For the Experienced Engineer and Scientist—William H. Ottley, Ed.—*Careers Inc.*, 96 p., illus., paper, $1.95. Leading national employers highlight their job opportunities for experienced men.

THE CELL: Biochemistry, Physiology, Morphology, Vol. I—Jean Brachet and Alfred E. Mirsky, Eds.—*Academic*, 816 p., illus., $22. Comprehensive treatise on the cell, written by specialists for biologists.

CHANGING THE FACE OF NORTH AMERICA: The Challenge of the St. Lawrence Seaway—Patricia Lauber—*Coward-McCann*, 96 p., illus., $2.50. The facts about a great technical enterprise, told for young people.

COMPARATIVE ANATOMY—William Montagna —*Wiley*, 397 p., illus., $6. Introductory textbook covering comparative anatomy, organogenesis and embryology.

COVERED WAGON GEOLOGIST — Charles N. Gould—*Univ. of Okla. Press*, 282 p., illus., $4. Autobiography from manuscript of the late geologist whose professional career spanned almost sixty years of pioneering accomplishments in the geology and paleontology of the Southwest.

THE DISCOVERER OF INSULIN: Dr. Frederick G. Banting—I. E. Levine—*Messner*, 192 p., $2.95. Biography for young people.

DISCOVERING MEANINGS IN ARITHMETIC—Foster E. Grossnickle and Leo J. Brueckner—*Winston*, 442 p., illus., $5.32. Basic ideas and methods for presenting processes in arithmetic so that they make sense to the grade school pupil.

EDUCATION AND MILITARY LEADERSHIP: A Study of the R.O.T.C.—Gene M. Lyons and John W. Masland, foreword by John Sloan Dickey—*Princeton Univ. Press*, 283 p., $5. Re-evaluation of the Reserve Officer Training Corps program.

ELECTRICAL SAFETY—H. W. Swann—*Philosophical Lib.*, 292 p., illus., $15. Attempt at comprehensive survey of electrical safety in British factories, homes, hospitals and public buildings.

ELECTRONIC CIRCUIT THEORY: Devices, Models, and Circuits—Henry J. Zimmermann and Samuel J. Mason—*Wiley*, 564 p., $10.75. Deals primarily with methods of analysis of electronic circuits.

ELEMENTS OF RADIO—Abraham Marcus and William Marcus—*Prentice-Hall*, 4th ed., 667 p., illus., $7. Designed for a one-year course.

ESSENTIALS OF CHEMISTRY—Alfred Benjamin Garrett, Joseph Fredric Haskins and Harry Hall Sisler—*Ginn*, 2nd ed., 606 p., illus., $7. High school textbook.

THE EVOLUTION OF NORTH AMERICA—Philip B. King—*Princeton Univ. Press*, 190 p., illus., map, $7.50. Treats geological evolution by selected regions which illustrate significant stages in that evolution.

FALLACIES IN MATHEMATICS—E. A. Maxwell —*Cambridge Univ. Press*, 95 p., $2.95. Aim of book is to instruct through entertainment, on the theory that a wrong idea may often be exposed more convincingly by following it to its absurd conclusion.

THE GLOBAL ATLAS: A New View of the World from Space—Frank Debenham, introd. by Bertrand Russell—*Simon & Schuster*, 98 p., 200 maps & illus. in color, $5.95. History of map-making including latest instruments used, with shadow-relief maps showing the elevations and curvature of the earth's regions.

HEARING: A Handbook for Laymen—Norton Canfield—*Doubleday*, 214 p., $3.50. Physician discusses in detail the medical, psychological and social problems of those afflicted by hearing handicap.

HELPING CHILDREN UNDERSTAND SCIENCE—Kenneth Freeman and others—*Winston*, 214 p., illus., $3.60. Teaching aid for developing science instruction in the elementary schools.

HISTORY OF AMERICAN MEDICINE: A Symposium—Felix Marti-Ibanez, Ed.—*MD Pub.*, 181 p., paper, $4. Thoroughly documented survey of the development of American medical research, teaching, practice and trends.

INDUSTRIAL FATTY ACIDS AND THEIR APPLICATIONS—E. Scott Pattison, Ed.—*Reinhold*, 230 p., illus., $7. Covers the production and processing of fatty acids with emphasis on practical technology and the chemistry involved.

THE KANSAS DOCTOR: A Century of Pioneering—Thomas Neville Bonner—*Univ. of Kansas Press*, 334 p., illus., $5. Entertaining history of Kansas physicians from frontier days to famous contemporaries such as the Menninger brothers.

A LABORATORY MANUAL OF COMPARATIVE ANATOMY—William Montagna and Walter Kenworthy—*Wiley*, 103 p., paper, $2.50.

THE LIFE AND LETTERS OF CHARLES DARWIN: Including an Autobiographical Chapter, Vols. I and II — Francis Darwin, Ed., foreword by George Gaylord Simpson—*Basic Bks.*, 1120 p., illus., 2 vols. boxed $10. Anniversary issue of the classic biography edited by Darwin's son.

LOUIS PASTEUR: Fighting Hero of Science—Madeleine P. Grant—*Whittlesey House*, 220 p., illus., $3.25. Scientist-author retraces Pasteur's life and work, based on her inquiries in France. Biography for young people.

MAN AND THE GOOD EARTH—Amabel Williams-Ellis—*Putnam*, 64 p., illus. by Robert Eggers, $2. Explains conservation to children.

THE MEASUREMENT OF VALUES—L. L. Thurstone—*Univ. of Chicago Press*, 322 p., $7.50. Twenty-seven papers by the late author, renowned for his application of precise mathematical measurement techniques to the behavioral sciences.

NATURAL SELECTION AND HEREDITY—P. M. Sheppard—*Philosophical Lib.*, 212 p., illus., $6. Treats in detail selected subjects which illustrate important principles, such as polymorphism, polygenic inheritance and selection, evolution of dominance and others.

NRL PARTICIPATION IN THE CSAGI ROCKET AND SATELLITE CONFERENCE, Sept. 30-Oct. 5, 1957—Vanguard staff, John P. Hagen and others —*U. S. Naval Res. Lab (Off. of Tech. Serv.)*. 125 p., illus., $2.75. Papers on rocket vehicles, satellites and their development and instrumentation.

PROCEEDINGS OF THE FIFTH ANNUAL COMPUTER APPLICATIONS SYMPOSIUM—R. A. Byerly and others—*Armour Research Foundation*, 153 p., illus., paper, $3. Discussion of applications of computer technology from the standpoint of the user.

PSYCHOLOGICAL PROBLEMS IN MENTAL DEFICIENCY—Seymour B. Sarasan, part II by Seymour B. Sarasan and Thomas Gladwin—*Harper*, 3rd ed., 678 p., $6.50. New edition supplemented by the genetic psychology monograph

(Continued on page 302)

it's easy to learn all about

DIGITAL COMPUTERS

THE RIDER 'PICTURE-BOOK' WAY

BASICS OF DIGITAL COMPUTERS

by John S. Murphy

New 3 volume 'picture-book' training course

Here is the easiest, quickest, most economical way of learning all about the exciting new field of digital computers. If you have a knowledge of the fundamentals of electronics, you can master the basics of digital computers and understand the details of any specific digital computer with this new 3 volume 'picture-book' course. Written by an expert in the computer field, text matter has been tested and proven in the training of computer field engineers and technicians. More than 350 illustrations support the text. Volume I covers the background of computers; Volume II, the components and units; Volume III, the operation of the computer. Basics of Digital Computers is ideal for training of programming personnel, maintenance men, for introductory training of engineering and technical personnel, for engineering students and for others who wish to broaden their knowledge of this new field.

#196, 3 vols., soft covers, set $7.50

#196-H, cloth bound, all 3 vols., $8.50

Now available at book stores or order direct.

10 day unconditional money-back guarantee.

John F. Rider Publisher, Inc. SN-5

116 West 14 St., N. Y. 11, N. Y.

I enclose $_____. Please send _____Basics of Digital Computers (soft cover set) $7.50 _____Cloth bound edition $8.50

Name_____

Address_____

City_____ Zone_____ State_____

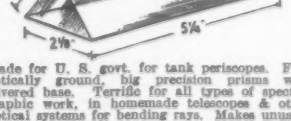
Add city and state taxes where applicable Canadian prices 5% higher.

AUTHORS WANTED BY N. Y. PUBLISHER

Leading publisher seeks book-length manuscripts of all types: fiction, non-fiction, poetry, scholarly and religious works, etc. New authors welcomed. Send for *free* booklet T8. Vantage Press, 120 W. 31 St., New York 1.

PRISMS $1.50

WT. ¼ LB.



Made for U. S. govt. for tank periscopes. Fine optically ground, big precision prisms with silvered base. Terrific for all types of spectrographic work, in homemade telescopes & other optical systems for bending rays. Makes unusual paper weight (paint your name on it) or conversation piece for mantel. You'll find many other uses. NEW, PERFECT! Cost U. S. govt. $25 ea. NOW—$1.50 ea. ppd. or 4 for $5.00. Same as above—1" long (no silver backing) $1 ea. 5 for $4. Postage paid on prepaid orders. Calif. res. add sales tax.

Volume Sales Co., War Assets Div., Dept. L59 3930 Sunset Blvd. Los Angeles 29, Calif.

Special Tool Bargains-Save Up to 50%

Newly Invented Automatic Window & Car Washer with CONTOURMATIC Self Adjustable Built-in SPONGE

No Mess—Not Sloppy—Saves EFFORT—TIME-WATER-MONEY . . .

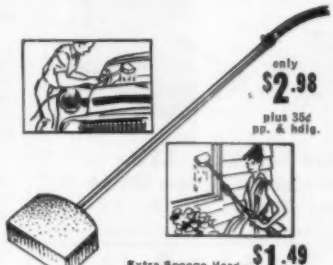
"DEW-BOY" is a wonderful new washing tool with automatic action. A real Handy-man. "DEW-BOY" does the washing for you without effort. The swivel-head follows the contour of cars, trucks, trailers, boats . . . glides easily over curves and protrusions . . . gets into corners of bathtubs and tiled rooms . . . reaches walls, ceilings, windows, light fixtures. Best of all, the built-in 3-stage "Valet Valve" saves trips to the faucet. Just turn on the water and sponge . . . sure fire results of shiny cleanness is your reward. Release any second on the spot. Can't scratch.

STAGE 1—turn water on . . . it stops at sponge head

STAGE 2—a light touch, and water flows gently for washing

STAGE 3—press harder, and release torrent for rinsing

No mess of water to flood garage, kitchen, bathroom, etc. . . . stops waste on your water bill.



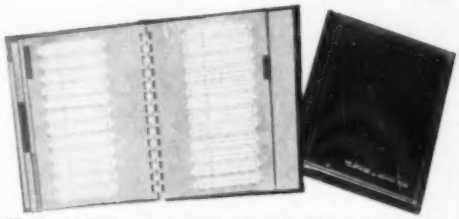
only **$2.98** plus 35¢ pp. & hdlg.

Extra Sponge Head—**$1.49** ppd.

MANY OTHER FEATURES:

● A long vinyl-covered aluminum handle gives you extra reach ● no bristles to mat or drop out ● cannot scratch delicate surfaces ● weighs only ten ounces ● rugged connection links up with garden hose ● long-lasting sponge head—replacements available—a child can attach it.

Every Name — Every Address — Always UP-TO-DATE!



LIFETIME ADDRESS BOOK

When Changes Occur, Pull Out Old Tab . . . Insert New One!

Here's just about the most practical address book ever created—a book that will never become obsolete. As a name, address or phone number changes, merely remove the old tab and insert a new one Comes completely indexed with space and tabs for 180 up-to-date listings. Padded, leather-like spiral binder with 14 Kt. gold trim indexed pages, each holding 12 tabs PLUS 12 additional pages at back of book for listing anniversaries, birthdays, Christmas card lists, etc. Closed size is 6½" X 7⅝" X ¾". Ideal for every home and office. 50 extra tabs with each book.

FREE! Up to 4 line gold imprint on quan. of 50 or more. Ppd. $1.49

VACU JET AUTOMATIC BOAT BAILER $2.95 ppd.

Draws out 3 to 5 gallons of water a minute. Sucks out the last drop. Will not scratch or injure motor. Simple to install. No tools required. Fits any size motor. Hooks on to the motor in a jiffy, and when motor is started suction through the impellers, water from the boat. It cleans as it bails and works like a genuine vacuum cleaner. Eliminates old fashioned hand method of bailing water. Fits easy in a tackle box. Weighs 10 ounces. Made of the finest plastic and vinyl tubing. No parts to wear or corrode. Fits any outboard motor except 3 h.p.

"Hoppy" Split-Image Transit Revolutionary LEVEL & INCLINE MEASURE

IDEAL FOR: Leveling and Grading Model Train Tables, Contour Plowing, Carpentry, Brick Laying, Cement Work, Guttering, Foundation Work, Yard Grading, Plumbing, Duct Installation, Shelving, Irrigation.

This amazingly accurate instrument indicates level and measures incline down to a fraction of an inch. Makes bubble type or string levels obsolete.

It not only indicates level, but shows exactly how much correction is needed. Just one person, using the split-image transit and target supplied with it, can perform any levelling, incline-measuring job quickly, easily, accurately—measures inclines down to the thinness of a dime at 25 feet. ppd. **$6.95**

AMAZING BLOCK & TACKLE

- **PORTABLE . . . weighs only 13 ozs., fits in pocket!**
- **ONE HAND OPERATION . . .**
- **POWERFUL . . . lifts up to 1000 lbs.!**

Amazing Work Saver for

● Hunters ● Yachtsmen ● Truck drivers
● Farmers ● Handymen ● Motorists

Here's an unusual tool, even for us! It's the tiny Midget Babe Block and Tackle. It weighs only 13 oz., yet is so powerful it lifts up to 1000 lbs. easily! Because of its great strength, small size, complete portability—this block and tackle has many uses. In your car for emergencies, for home, factory, farm for loading heavy articles. For sportsmen: loading deer, boats, etc. For anyone who has to do heavy lifting! Fine engineered throughout, best grade aluminum, steel axles, pre-lubricated for life. Hoists have two lifting slings, at top and bottom, with heavy welded steel rings. Slings can be doubled for extra strength. Complete with 50 ft. nylon cable. 5 to 1 ratio—1000 lb. test. **$9.95**
Carrying bag. Instructions . . . . ppd.
ALSO AVAILABLE—Tiny Babe—lifts up to 2000 lbs.! With 100 ft. nylon cord, 7-1 ratio—2000 lb. test—15 oz. wgt. Twice as powerful as $9.95 model—only **$12.95** ppd.
1 yr. guarantee on both models.

SAVE $25 ON THIS UNUSED Gov't Surplus—STAINLESS STEEL CHISEL & GOUGE SET

This 6 piece surgical steel set would ordinarily cost you $33 or more if purchased at a regular supply house—but we're selling them to you for less than the price you would pay for ordinary chisels. These are among the finest quality tools you can buy for cutting, carving and whittling wood—designed to last a lifetime. If you could hold these solid, heavy chromed stainless steel tools in your hands, feel their balance, their strength, you'd know this is a fabulous once-in-a-lifetime bargain. **$7.98** ppd.

Gov't Surplus WEBBED TOW CABLE

Originally made for U. S. Air Force. Never used. Test proven for towing trucks, cars, etc. 15 ft. long with extra heavy duty spring snap cable hooks. 2" wide, nylon reinforced cable is ¼" thick and 1¾" wide at ends. Useful in home or keep in car for emergencies.

$1.95 plus 35¢ pp. & hdlg.

60 Pc. Set Wire Gauge Chrome Vanadium Drills. Top quality high test Chrome Vanadium Drills designed for hand drilling through toughest steels, woods, plastics, iron and aluminum. Precision ground, long-lasting cutting edges.

Nos. 1 through 60, A **$24.95** value —NOW: **$5.40.** Same set above available with Blue Index Container — **Only $6.65.** Also available 61-80 set of high quality drills, in plastic kit with marked pocket for each drill —**Only $2.90.**

All above drill sets plus 35¢ pp. & hdlg.

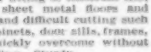
"Hoppy" Split-Image Transit Revolutionary LEVEL & INCLINE MEASURE

IDEAL FOR: Leveling and Grading Model Train Tables, Contour Plowing, Carpentry, Brick Laying, Cement Work, Guttering, Foundation Work, Yard Grading, Plumbing, Duct Installation, Shelving, Irrigation.

This amazingly accurate instrument indicates level and measures incline down to a fraction of an inch. Makes bubble type or string levels obsolete.

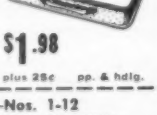
It not only indicates level, but shows exactly how much correction is needed. Just one person, using the split-image transit and target supplied with it, can perform any levelling, incline-measuring job quickly, easily, accurately—measures inclines down to the thinness of a dime at 25 feet. ppd. **$6.95**

CONTOUR SCRIBER



Permits professional fitting of linoleum tile, wood, plastic and sheet metal floors and walls. Obstructions and difficult cutting such as ground pipes, cabinets, door sills, frames, etc., simply and quickly overcome without removing any molding. Sturdy, heavy metal construction, adjusts to 12¾"—parallel and irregular surfaces are perfectly matched. **$1.00** ppd.

Top-Grain-Like Leather Finish ATTACHE CASE



Sturdily built with heavy, long-life plastic cover. Looks just like expensive top-grain leather attache case. Easy-slide zipper on three sides of case. Heavy plastic handle is firmly attached to case with brass hardware. Measures 15⅝ x 10½ x 2½". large and roomy enough to serve a multitude of uses. Ideal for businessmen, salesmen, students. Can even serve as luggage for overnight trips.

$1.98 plus 25¢ pp. & hdlg.

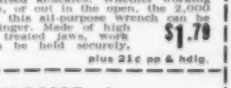
Hobbyist, Handyman, Housewife, Gardener SQUEEZ-CLIP KIT

Fixes or Fastens easier, faster, stronger than a stitch, staple, screw, nail or tie.

The Squeez-Clip Kit can do so many things, you'll wonder how you ever did without it! You get a special caliper with indented slots in the jaws plus 500 assorted size galvanized, rust-resist clips. The clips, shaped like a staple, fit into the pliers. Then, just squeeze lightly and you've got a streamlined, triangular ring of a thousand uses. Use to install auto seat cover, repairs canvas tears, belts, straps, attach vines and plants to stakes and trellises, clip papers, join lengths of rope, etc. An invaluable aid to home & industry.

Only $1.98 plus 35¢ pp. & hdlg.

10" F-VISE SAFETY WRENCH



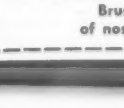
1 ton tested, non-slip grip . . . yet releases at a FLICK of the finger.

Safe! No more skinned or bruised knuckles! Whether working in an almost inaccessible place, or out in the open, the 2,000 pound tested, non-slip grip of this all-purpose wrench can be released with a flick of the finger. Made of high grade alloy steel, with heat treated jaws, work of any size up to 1¼" can be held securely.

$1.79 plus 25¢ pp & hdlg.

Full Range—Nos. 1-12 Quality Camel Hair BRUSHES

For Artists, Hobbyists Homeowners



Superb quality brushes for every conceivable need from fine line work to broad brush strokes. You'll be amazed at the soft yet firm texture of these select brushes, each solidly set in metal grip to give years of use. Perfect for artwork, architects, touching up around the house, cleaning electrical and optical instruments and guns.

Brushes—2 ea. of nos. 1 thru 12— $2.00 ppd.

2.6 AMP ¼" POWER DRILL

It's Almost Impossible to "Top" This Amazing Value!

MANNING-BOWMAN

with Jacobs Geared Chuck & Key

A Product of Famed McGRAW-EDISON

The most important part of any workshop is an almost foolproof, dependable drill—and THIS IS IT! A scientifically designed and balanced unit . . . beautifully styled . . . with lightweight, durable, blue tinted aluminum diecast housing. Features powerful Universal type, 115 Volt, AC-DC motor with bronze bearings "oiled for life". Precision ground ball thrust bearing. Tailor fit grip and locking type insulated trigger switch. Powerful 2.6 amp. 2000 R.P.M. motor makes drilling thru hardwoods and even ¼" thick hard metals a "cinch". Extra long, hey duty power cord for safety and convenience. UL and CSA approved.

ONLY $13.95 plus 80¢ pp. & hdlg.

Drills and Saws Any Shape! Supreme Hole Saw

$1.00 ppd.

Simply insert the amazing Drilsaw into the chuck of your ¼" electric drill and you're ready to cut any shape you desire. Lower portion of Drilsaw acts as regular ¼" drill which easily bores thru wood, plaster, plastics, plywood and similar materials. Then, after penetration, the multiple keen cutting edges of the Drilsaw, cleanly and speedily cut in any direction you move. Cut circles, triangles, zig-zags, any conceivable shape you wish—in seconds!

13-Pc. Set Chrome Vanadium DRILLS in Metal Drill Index

only **$1.88** plus 12¢ for pp. & hdlg.

PERFECT FOR SPEED DRILLING

Just imported from West Germany, these 13 precision Chrome Vanadium Drills, from 1/16" thru ¼" by 64ths are set in a two-sleeve steel, indexed container for easy and instant selection. Full jobber length shanks. Easily and cleanly bite through toughest steels, woods, plastics, iron and aluminum. Unconditionally guaranteed for thousands of drillings.

IMPORTANT

Order Today and Save. Minimum order $1.00. Send Check or M.O. C.O.D. orders plus fee. Money Back Guarantee. Protects you against risk.

SCOTT-MITCHELL HOUSE, Inc.

Dept. 2405—415 South Broadway, Yonkers, N. Y.

Canadian prices 5% higher.

Volume Sales Co., War Assets Div., Dept. L59
3930 Sunset Blvd. Los Angeles 29, Calif.

(Continued on page 302)

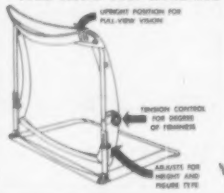
ADJUSTABLE "BACK-AID" CAR SEAT

An Entirely New Innovation in Driving Comfort

Now for the first time you can sit in regulated comfort. Three way adjustable Mark-Fore Car Seat gives you:
1—A firm underseating.
2—A firm tensil back rest.
3—Individual adjustment for height, degree of "push" and angle of tilt.
4—Keeps you alert and refreshed for long distance driving.

The result of more than 8 years of research and development in cooperation with orthopedic specialists and road tested over thousands of miles.

NEW MARK-FORE 3-WAY ADJUSTABLE BACK-AIDE FOR MILES OF CAREFREE DRIVING



OUR PRICE
$12.95
Postpaid
$13.95
West of the Mississippi
Comparable Value $23.95

*Fiberglas Mesh Seat and Back (Prevents Sweating)
*Special Alloy Steel Frame
*Heavy Gage Leatherette Trim

JOHN SURREY, LTD.
11 West 32nd St., Dept. SN-16
New York 1, N. Y.

Make over 150 Small Computing and Reasoning Machines with . . . BRAINIAC®

A BETTER ELECTRIC BRAIN CONSTRUCTION KIT

EQUALS THE ORIGINAL GENIAC® electric brain construction kit (1955) PLUS many improvements and additions: over 600 parts —including 116 improved patented wipers so that all switches work well. Instead of covering only 33 machines, BRAINAC gives full specifications for 151 computing, reasoning, arithmetical, logical, puzzle-solving and game-playing machines . . . all 33 GENIACS (1955), 13 TYNIACS (1956), and 105 BRAINACS (1957-58), etc.

THIS IS BRAINIAC! With our Brainiac Kit K 17, you can build over 150 small electric brain machines and toys which "think," compute, reason, and display intelligent behavior. Each one works on a single flashlight battery . . . is FUN to make, FUN to use and play with, and TEACHES you something new about electrical computing and reasoning circuits. All connections with nuts and bolts—no soldering required. Originated and produced exclusively by Berkeley Enterprises, Brainiac is the result of 8 years' design and development work with miniature mechanical brains including: Geniac (see "Geniacs: Small Electric Brain Machines and How to Make Them" by Edmund C. Berkeley, 64 pp., published by Geniac Project, a partnership with Oliver Garfield discontinued September 1955), Tyniac (1956), Relay Moe (automatic relay machine playing tit-tat-toe—pictured in Life Magazine, March 19, 1956), Simon (miniature automatic digital computer with 129 relays—see "Simple Simon" by E. C. Berkeley in Scientific American, November, 1950), Squee (electronic robot squirrel—see "Light Sensitive Electronic Beast" by E. C. Berkeley in Radio Electronics, Dec. 1951), etc.

WHAT CAN YOU MAKE WITH BRAINIAC KIT K17? Over 150 machines including — LOGIC MACHINES: Syllogism Prover, Intelligence Test, Boolean Algebra Circuits, Douglas MacDonald's Will Analyzer. A Simple Kalin-Burkhart Logical Truth Calculator, etc. GAME-PLAYING MACHINES: Tit-Tat-Toe, Nim, Wheeled Bandit, Black Match, Sundorra 21, etc. COMPUTERS: To add, subtract, multiply or divide using decimal or binary numbers. Forty-Year Calendar, Prime Number Indicator, Money-Changing Machine, etc. CRYPTOGRAPHIC MACHINES: Coders, Decoders, Lock with 15,000,000 Combinations, etc. PUZZLE-SOLVING MACHINES: The Missionaries and the Cannibals, Age-Guessing Machine, Submarine Rescue Chamber, Daisy Petal Machine, Fox-Hen-Corn & Hired Man, Uranium Space Ship and the Space Pirates, The Three Monkeys Who Spurned Evil, General Alarm at the Fortress of Dreadeerie, etc. QUIZ MACHINES: History, geography, trigonometry, grammar, statistics, calculus, etc.

WHAT COMES WITH YOUR BRAINIAC KIT . . .
Complete Plans, Instructions, Explanations & Hardware:

- Every part needed to build Geniacs, Tyniacs, Brainacs—over 600 pieces including control panel, multiple switch discs, jumpers, improved wipers, bulbs, sockets, washers, wire, battery and special tools.
- Complete description of 151 experiments and machines.
- Over 160 circuit diagrams including 46 exact wiring templates.
- Manual "Tyniacs: Small Electric Brain Machines and How to Make Them" by Edmund C. Berkeley, 1956, 48 pages—includes Introduction to Boolean Algebra for Designing Circuits.
- "How to Go From Brainiacs and Geniacs to Automatic Computers" by Edmund C. Berkeley.

only $17.95 . . . why pay more?

BRAINIAC KIT (1958 Model) K17 . . . the kit with limitless possibilities—backed by an organization of 10 years standing in the computer field $17.95
(For shipment west of Mississippi, add 80¢; outside U. S. add $1.80)

7-Day Full Refund Guarantee If Not Satisfactory

WHO IS EDMUND C. BERKELEY? Author of "Giant Brains or Machines That Think," Wiley 1949, 270 pp. (15,000 copies sold); Author of "Computers: Their Operation and Applications," Reinhold, 1956, 366 pp.; Editor & Publisher of the magazine, *Computers and Automation;* Maker and Developer of small robots; Fellow of the Society of Actuaries; Secretary (1947-53) of the Association for Computing Machinery; Designer of all the Tyniacs and Brainacs, more than half of the 33 Geniacs (1955); Designer of the patented Multiple Switch Disc and other features in the 1955 Geniac kit.

MAIL THIS COUPON

BERKELEY ENTERPRISES, INC.
815 Washington St., R186, Newtonville 60, Mass.

Please send me Brainiac Kit K 17. (Returnable in 7 days for full refund if not satisfactory—if in good condition.) I enclose $_____ in full payment.
My Name and Address are attached

Books of the Week

(Continued from page 300)

"Psychological and Cultural Problems in Mental Subnormality."

THE PSYCHOLOGY OF AFFILIATION: Experimental Studies of the Sources of Gregariousness —Stanley Schachter—*Stanford Univ. Press,* 141 p., $3.75. One of the first systematic investigations into the sources of man's desire to be with others.

RADIOISOTOPES IN THE SERVICE OF MAN—Fernand Lot—UNESCO *(UNESCO Publications Center, N. Y.),* 82 p., illus., paper, $1. On the applications of the new artificial radioactive elements in industry, therapeutics, insect pest control, study of meteorites and other fields.

THE RIDDLE OF THE SCROLLS—H. E. Del Medico, transl. from French by H. Garner—*McBride, R. M. Co.,* 432 p., illus., $4.95. Discusses the problems of the date, authorship, authenticity, purpose and meaning of the Dead Sea Scrolls

RIVER WORLD: Wildlife of the Mississippi—Virginia S. Eifert—*Dodd,* 271 p., illus. by author, $4. From the ice of Lake Itasca in Minnesota we follow the author to the bayous of Louisiana, learning about plants, birds, fish and insects along the river.

SOLID STATE MAGNETIC AND DIELECTRIC DEVICES—H. W. Katz, Ed.—*Wiley,* 542 p., illus., $13.50. Textbook about the theory and application of solid state devices and components, exclusive of the transistor.

THE UPPER ATMOSPHERE—H. S. W. Massey and R. L. F. Boyd—*Philosophical Lib.,* 333 p., illus., $17.50. Detailed accounts of phenomena such as radio fadeout, night airglow auroras, meteors, cosmic rays and currents responsible for magnetic variations. For students and for scientists in other fields.

URBAN SPRAWL AND HEALTH: Report of the 1958 National Health Forum—Luther H. Gulick and others—*National Health Council,* 228 p., paper, $1.75. Discussions by leaders in city planning, public administration and health.

WONDERS OF THE WORLD—Leonard Cottrell—*Rinehart,* 249 p., illus., $4.50. From the technical wonders of the ancient world, to such feats of engineering as the Empire State Building, the Golden Gate Bridge, and the radio telescope at Jodrell Bank, England.

THE WORLD OF THE MICROSCOPE—L. J. Ludovici—*Putnam,* 128 p., illus. by Jerry Robinson, $2.95. Tells young readers of man's important discoveries about beneficial and deadly microbes.

Science News Letter, May 9, 1959

MICRO-ADS

Equipment, supplies and services of special interest to scientists, science teachers and students, science-minded laymen and hobbyists.
25¢ per word, payable in advance. Closing date 3 weeks prior to publication (Saturday).
SNL, 1719 N St., N.W., Washington 6, D. C.

MICROSLIDES

MICROSLIDES: INSECTS, MARINE LIFE, Zoological, Botanical, British Fresh Water Algae. Send for Complete list Free. Esbe Laboratory Supplies. 459 Bloor St., W. Toronto, Ontario, Canada.

POSITION WANTED

EXPERIENCED COLLEGE PUBLIC RELATIONS man; writer-photographer; recognized byline, translating science to interesting feature stories; details on request. Box 97, Marble Falls, Texas.

SALESMEN WANTED

SALESMEN! PART TIME OR SEMI RETIRED BUT WANT TO KEEP ACTIVE? Earn up to $10,000 yearly selling shelving—parts bins—shop equipment. Write, BFC Corporation, 2905E. Hedley, Philadelphia 17, Pa.

Brushes—2 ea. of nos. 1 thru 12— $2.00 ppd.

Send Check or M.O. C.O.D. orders plus fee. Money Back Guarantee. Protects you against risk.

Dept. 2405 —415 South Broadway, Yonkers, N. Y.

Kodak reports on:

who can tell you how to speed up time . . . electronics through joy . . . how to prevent a pile of fish from catching fire

Months to seconds

A *Cine-Kodak Special Camera* made most of the movies you have ever seen of a bean developing into a bean plant or a cow pasture developing into a steel plant. The *Cine-Kodak K-100 Camera*, which lists from $299, can likewise be adapted for this technique. No great resources in mechanical skills or facilities are demanded.

Mr. Fred O'Brien, Eastman Kodak Company, 400 Plymouth Avenue North, Rochester 4, N. Y., can tell you how to go about it.

TV—rugged and sophisticated

Logic and reason connect this happy scene of commerce with our claim to be putting together the western world's most rugged and sophisticated television apparatus.

Loath to fight World War III in an ad (though this may not be a bad place to fight it, personal safety considered), we do not here detail functions, specifications, or potentialities of such apparatus as we have already created. It suffices to generalize from the concept that to place a living human eye at the payoff end of an intricate and talented optical device may be inconvenient and unwise. Where the environment is too violent for the eye, we have developed a knack for substituting a television camera.

This calls for cameras which a TV actor would scarcely recognize, nor are they as simple as those which read boxcar numbers in remote corners of railroad yards. We take pickup tubes (drinking deep draughts of the knowledge of their manufacturers, just as they are welcome to milk us when it comes to photography) and festoon the tubes with electronic circuitry, optical elegance, and precision-mechanical musculature—all neatly woven together. The whole we put in small packages. We can make the packages do their duty gracefully under 15 g's of shock and 145 db of acoustic energy in each octave to 20,000 cycles/sec for x minutes at 200°F or y hours at −65°F after z months of storage at −80°F.

How did we happen to get electronically involved? Well, the biggest part of our business has always been ways and means of presenting an image to the eye. Electronics engineers we have in goodly numbers on such projects as machines that take a very quick look at a Kodacolor negative and instantly reach a complicated decision on how to vary some colored light beams to bring the greatest joy to the lady calling for her Kodacolor Prints. With what such machines cost, they have to work when you turn them on. Like virtue, reliability becomes its own reward. This viewpoint our electronics engineers must quickly acquire.

Another corps of Kodak electronics engineers bring to TV-systems development the experience of packaging radio transmitters and receivers to work inside artillery shells. This, too, we got into from catering to the public's photographic desires. The armed forces had figured that an outfit capable of flooding the world with accurately timed photographic shutters could do as well with artillery fuzes. Later, when fuzes came to be operated by radio echoes instead of clockwork, what was more natural than that we make that kind?

If you have some business to discuss about rugged and sophisticated electronics, get in touch with Eastman Kodak Company, Apparatus and Optical Division, Rochester 4, N. Y.

Defense from oxygen

A can of sardines provides excellent protein for a field hand's lunch in the cotton country and a livelihood for a Maine man who would rather work on a herring seiner than a gas station. The applecart, however, is tipping a little. The field hand's wife can now often afford to slip a chicken sandwich into the lunch pail.

While the herring seiners go looking for gourmets to eat their catch, other fishermen are setting their seines for *Brevoortia tyrannus*, the fish the Pilgrim saw the Indian drop into the hole with the corn kernels, the most abundant of Atlantic coast fishes, ignored by cookbooks, the menhaden. To get it into the field hand's lunch pail, it is converted into chicken muscle tissue.

This complex process requires cooking the menhaden at a temperature below 180°F (which will coagulate and separate the protein but not degrade it); then squeezing, drying, and grinding the stew, adding it to corn and other agricultural and mineral products, and feeding the mixture to chickens. The drying step is critical. If oxidation of the fish fat gets out of hand, not only may the protein and vitamins be destroyed, but fire may break out.

This we have set about to prevent. To assure ourselves of a good supply of photographic developer, we long ago set up to make phenolic reducing agents in large quantity. We made so much that we had to find other markets. The difference between a reducing agent and an antioxidant is a mere technicality. One of our antioxidants, butylated hydroxytoluene, has long been accepted by competent and critical authorities as safe even for direct human food, at the proper levels. As *Tenox BHT—Agricultural Grade*, we are now selling it to the fish meal people. It saves them money. Their 40-ton piles of fish scrap require less costly shifting to keep them cool. A week is reported to have been cut off the curing time.

Even if you have no 40-ton piles of fish in the sun, Eastman Chemical Products, Inc., Kingsport, Tenn. (Subsidiary of Eastman Kodak Company), would love to talk to you about deceleration of oxidation on the grand scale. Incidentally, the closely allied Gulf of Mexico menhaden, Brevoortia patronus, *poses less of a self-heating problem. We wonder why.*

Price stated is subject to change without notice.

This is another advertisement where Eastman Kodak Company probes at random for mutual interests and occasionally a little revenue from those whose work has something to do with science

Kodak
TRADE MARK

7-Day Full Refund Guarantee If Not Satisfactory
My Name and Address are attached
Philadelphia 17, Pa.

New Machines and Gadgets

For sources of more information on new things described, send a self-addressed stamped envelope to SCIENCE NEWS LETTER, 1719 N St., N.W., Washington 6, D. C., and ask for Gadget Bulletin 986. To receive this Gadget Bulletin without special request each week, remit $1.50 for one year's subscription.

PAINT BRUSH has nylon filaments, each of which tapers gradually in thickness from the ferrule to a fine flexible point at the flag end. Tapered filaments are claimed to afford greater control and paint flow. The fine chisel tip produces a flawless painted surface.

Science News Letter, May 9, 1959

DRAFTING MACHINE of aluminum combines a T-square, rulers, protractor and triangles while covering 400 square inches of drawing surface. Weighing only three and a half pounds, with its drawing board, it folds like a jackknife to fit into a briefcase.

Science News Letter, May 9, 1959

FISH HOOK GUARDS of plastic come in three sizes and may be used to carry treble and double hooks safely. They are triangular in shape, with one side open, and are easily snapped on or off the hooks. The guards keep hooks from tangling in a tackle box and make it possible to carry baits in a pocket.

Science News Letter, May 9, 1959

INFLATABLE LAMPS, shown in the photograph, for decorating patios, pools and playrooms are made of colorful plastic. They come complete with light plugs and six-foot extension cords. When inflated, they form globes about 15 inches in diameter. When deflated, the lamps weigh one pound and are easily shipped and stored.

Science News Letter, May 9, 1959

BRASS DARTS have revolving plastic fins that are also replaceable. For the beginner or the skilled player, they are available in light, medium or heavy weight. The darts come in sets of three and are guaranteed for one year.

Science News Letter, May 9, 1959

ORBITAL SANDING MACHINE for the home craftsman is made of die-cast aluminum for compactness and light weight. It has a polished finish and a slide snap on the top of a curved handle. Equipped with three sheets of abrasive paper, it has a direct drive induction motor coupled with an enclosed counterweight for vibration-free sanding.

Science News Letter, May 9, 1959

CHEMICAL CALCULATOR is a flat circular table eight inches in diameter with complete instructions on the reverse side. It offers students and technicians a fast, accurate way to determine whether a specific reaction will occur and, if so, the chemical compounds involved in the reaction.

Science News Letter, May 9, 1959

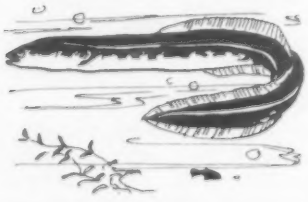
AESOSOL INSECTICIDE in a two-ounce container is small enough to carry in pocket or purse. It is said to be harmless to humans and animals and to protect against flies, mosquitoes, ants, gnats and other insects. A metered valve controls the amount of spray.

Science News Letter, May 9, 1959

Nature Ramblings

By HORACE LOFTIN

Lawbreakers With Fins



SOME STATES have their fish conservation agencies nicely split by law into two distinct bodies: one organization dealing with fresh water fishes, the other with salt water species. This probably works fine for purposes of administration and legal codes. But it leads to perplexity in the eyes of the biologists and fishery management scientists who have to decide when a fish is a "salt water" or "fresh water" species. The fish will sometimes not cooperate.

The American eel is an example. This well-known denizen of mill ponds and creeks throughout the eastern half of the country spends its adult life in fresh water. But then, an urge to migrate carries it from the creeks into the rivers and thence to the coast. Once in the ocean, it makes a mighty trip to an area somewhere in the mid-Atlantic near Bermuda, where it mates, spawns and dies. The larval young then make the trip to the coast and up the rivers, where they spend their adulthood.

In contrast, there are species like the salmons which pass their adult lives in the ocean, then return to their natal stream far upriver to lay their eggs.

In between these two extremes are a whole host of fish that just cannot seem to "make up their minds" as to whether they like fresh or salt water best.

The very common pinfish, a notorious bait thief on the Atlantic and Gulf coasts, can be taken from the very head of a fresh water spring down to many fathoms in the ocean depths. Although they are apparently born in the sea and pass a great deal of their life there, many mullet frequent pure fresh water streams for lengthy periods.

Florida rivers are especially noted for their "mixed-up" fish. In many spots upriver, a fisherman never knows whether his next catch will be a bluegill or largemouth bass, or a "salt water" sheepshead or stingray! Many sharks, rays and sawfish are partial to fresh water.

Such fish as listed above are not commonly thought of as estuarine species—those that pass their lives near the meeting place of fresh and salt water. They survive in extremes of freshness and saltiness. They apparently have not read the laws that men have made about them!

Science News Letter, May 9, 1959